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COMMON SEA-WEEDS

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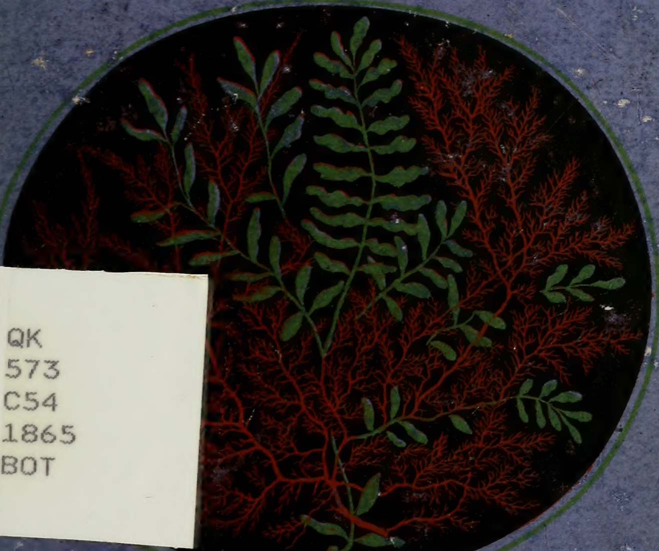
BY

MRS. L. LANE CLARKE

AUTHOR OF "OBJECTS OF THE MICROSCOPE"



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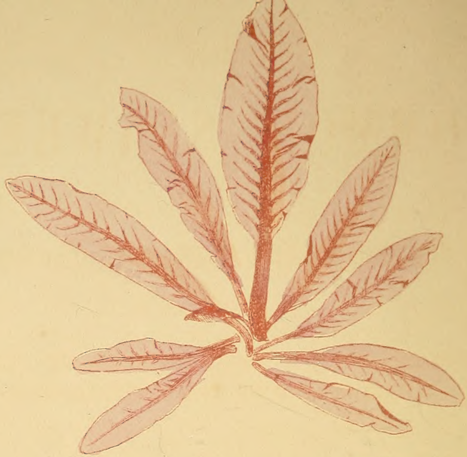

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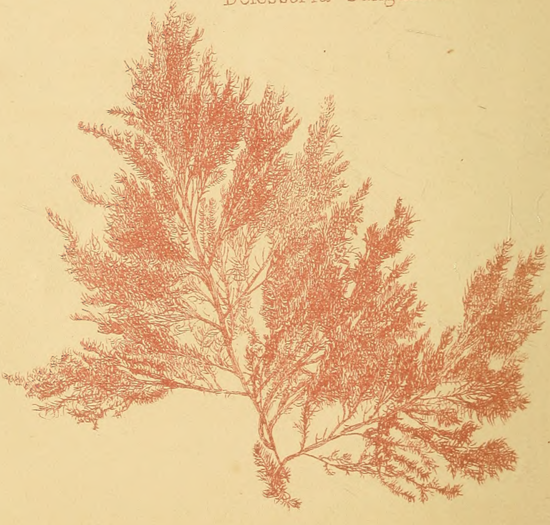

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THE
COMMON SEAWEEDS
OF THE
BRITISH COAST AND CHANNEL ISLANDS;

WITH

SOME INSIGHT INTO THE MICROSCOPIC BEAUTIES OF
THEIR STRUCTURE AND FRUCTIFICATION.

BY

LOUISA LANE CLARKE,

AUTHOR OF "OBJECTS FOR THE MICROSCOPE."

With Tinted Plates.

"The eye sees no more than it brings with it the power of seeing."

LONDON:
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Introduction.

THERE is felt by many seaside ramblers a want of some unscientific, easy Guide to the Seaweeds and contents of rock-pools on the English coast. There are most valuable works by HARVEY and LANDESBOROUGH on the subject, but more expensive and more scientific than suits the minds of those who seek for health and rest in the sweet summer months by the seaside.

To supply that want I purpose describing the Seaweeds, not exactly in the order arranged by Algæologists (though a systematic aid is given for the use of Collectors); but, taking the coast anywhere as a book, opening and closing as the great sea ebbs and flows, I shall begin with the first-tide pools, and find interest for my readers until the next range is uncovered, and more objects may be found.

Then we shall take advantage of a gale of wind, and see what the waves cast up from depths unattainable by mortal hand. Doubtless we shall find more than Seaweeds on the glistening shingle or the soft sea sand; nor will I stint my information, knowing so well the questions that arise as we turn over the heaps, and find "such treasures;" although our present purpose is merely to describe the Common Seaweeds of the Sea Shore.

CAMBRIDGE PARK, GUERNSEY.
July, 1865.

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Synopsis of Seaweed Tribes.

They are divided into three great classes—The Olive—The Red—The Green Seaweeds.

OLIVE GREEN, OR MELANOSPERMEÆ.

(Marine plants of an olive green or olive brown colour.)

Fructification.—Monœcious or *diœcious.* Spores either external or contained, singly or in groups, in proper conceptacles. *Antheridia* (transparent cells) with active small bodies moving by means of vibratile hairs or *cilia.*

1 Seaweeds of an olive brown or blackish-green colour, *Fucaceæ.*
Seaweeds of an olive green or yellowish-green colour.

2 Fronds membranaceous, inarticulate.
Fronds articulate.

3 Spores external, borne on jointed filaments, *Sporochnaceæ.*
Spores on the surface of the frond.

4 Spores covering the whole of the frond, or in ill-defined patches . . . . *Laminariaceæ.*
Spores grouped together in well-defined spots or lines, *Dictyotaceæ.*

5 Fronds composed of articulate filaments interlaced together. Spores immersed . . . . . *Chordariaceæ.*
Fronds filiform, jointed. Spores external. *Ectocarpaceæ.*

GENERA OF THE FUCUS TRIBE.

HALIDRYS—Air vessels, long, pod-shaped.

CYSTOSEIRA—Air vessels in the branches; receptacles small.

PYCNOPHYCUS—Root composed of branching fibres; receptacles cellular.

FUCUS—Root a round or flattened disc; receptacles large, filled with *mucus*, traversed by jointed threads.

HIMANTHALIA—Frond round, small, and cup-shaped; receptacles resembling fronds, very long, repeatedly forked.

GENERA OF THE SPOROCHNUS TRIBE

FAMILY I., OF THE ARTHROCLADIA,

With their spores attached to slender filaments.

DESMARESTIA—Frond solid, either filiform or flat, distichously branched.

ARTHROCLADIA—Frond cylindrical, furnished with whorls of small slender jointed filaments.

FAMILY II., OF THE SPOROCHNUS,

With their spores produced in knob-like receptacles.

SPOROCHNUS—Receptacles lateral, on short stalks.

CARPOMITRA—Receptacles terminal at the tips of the branches.

GENERA OF THE LAMINARIA TRIBE.

ALARIA—Leaf with a distinct mid-rib.

LAMINARIA—Frond without a mid-rib.

CHORDA—Frond cylindrical, unbranched, hollow, and constricted at intervals.

GENERA OF THE DICTYOTA TRIBE.

CUTLERIA—Frond ribless, irregularly cleft; *sori* dot-like, and scattered.

HALISERIS—Frond forked, with a mid-rib.

PADINA—Frond fan-shaped; *sori* linear.

ZONARIA—Frond lobed; *sori* roundish.

TAONIA—Frond irregularly cleft, somewhat fan-shaped; *sori* linear

DICTYOTA—Frond linear, forked; *sori* roundish.

STILOPHORA—Fronds cylindrical; spores forming a wart-like *sori.*

DICTYOSIPHON—Fronds tubular; spores irregularly scattered, solitary, or in dot-like *sori.*

STRIARIA—Spores in *sori,* arranged across the frond in lines.

PUNCTARIA—Frond flat and leaf-like; spores in small distinct dots.

ASPEROCOCCUS—Frond tubular, cylindrical, or compressed; spores in dot-like *sori.*

LITOSIPHON—Frond cartilaginous, filiform; spores scattered.

GENERA OF THE CHORDARIA TRIBE.

CHORDARIA—Frond, the central part *firmly* gelatinous.

MESOGLOIA—Frond, the centre of the frond *loosely* gelatinous.

LEATHESIA—Frond tuber-shaped.

RALFSIA—Frond crustaceous.

ELACHISTA—Filaments pencilled, rising from a tubercular base.

MYRIONEMA—Filaments rising from a flat base, minute.

GENERA OF THE ECTOCARPUS TRIBE.

CLADOSTEPHUS—Stem not articulated, the *ramuli* alone jointed and set in whorls.

SPHACELARIA—Stem articulated, branched; *ramuli* distichous, pinnated.

ECTOCARPUS—Stem jointed, very slender, hair-like, generally much branched and flaccid.

MYRIOTRICHIA—Stem unbranched; *ramuli* in whorls, tipped with transparent fibres.

RHODOSPERMEÆ.

THE RED SEAWEEDS.

1 Frond with a calcareous coating . . . . *Corallinaceæ.*
Frond cellular or filiform, not encrusted.

2 Frond (usually) filiform, and jointed either externally or internally, or composed of articulated fibres, combined together by gelatine.
Fronds continuous.

3 Spores contained in external urn-shaped receptacles (*ceremidia*) . . . . *Rhodomelaceæ.*
Spores not in *ceremidia.*

4 Spores contained in naked berry-like receptacles, termed *favellæ.* . . . . *Ceramiaceæ.*
Spores immersed in the frond, or sub-external, *Cryptonemiaceæ.*

5 Tetraspores scattered.
Tetraspores in defined spots . . . . . *Delesseriaceæ.*

6 Tetraspores immersed in the branches and *ramuli,* *Laurenciaceæ.*
Tetraspores either spread over the frond, or in cloud-like spots . . . . *Rhodymeniaceæ.*

GENERA OF THE RHODOMELA TRIBE.

Odonthalia—Frond flat, serrated, with a faint mid-rib; colour, very dark red.

Rhodomela—Frond cylindrical, inarticulate, opaque.

Bostrychia—Frond cylindrical, inarticulate, dotted.

Rytiphlœa—Frond cylindrical, inarticulate, transversely striate.

Polysiphonia—Fronds thread-like, articulate, longitudinally striate.

Dasya—Fronds cylindrical, with inarticulate stems and spreading jointed *ramuli.*

GENERA OF THE LAURENCIA TRIBE.

Bonnemaisonia—Frond filiform, solid, much branched; the branches with opposite awl-shaped *cilia.*

Laurencia—Frond cylindrical, or compressed, pinnatified; the *ramuli* blunt.

Chrysymenia—Frond filled with watery gelatine, not constricted or chambered.

Chylocladia—Frond contracted at intervals, filled with watery gelatine.

GENERA OF THE CORALLINE TRIBE.

Sub-order of the Corallineæ.—Frond filiform, articulated.

Coralline—Frond pinnated; *ceramidia* terminal, simple.

Jania—Frond dichotomous; *ceramidia* tipped with two horns like *ramuli.*

Sub-order—Nulliporeæ—Frond crustaceous or foliaceous, opaque, not articulated.

Melobesia—Frond stony, forming either a crustaceous expansion or a foliaceous or shrub-like body.

Hildenbrandtia—Frond cartilaginous, not stony, forming a crustaceous expansion.

Hapalidium—Frond plane, transparent, composed of cells radiating from a centre.

GENERA OF THE DELESSERIA TRIBE.

Delesseria—Frond leaf-like, of delicate form, with a mid-rib running through it.

Nitophyllum—Frond without a mid-rib, delicate, expanded; sometimes marked with vague veins.

Plocamium—Frond linear or filiform, much branched, distichous; *ramuli* secund.

GENERA OF THE RHODYMENIA TRIBE.

Stenogramme—Conceptacles linear, rib-like; tetraspores collected into dense oval well-defined *sori.*

Rhodymenia—Tubercles convex, scattered; frond flat.

Sphærococcus—Frond linear, compressed, and distichously branched.

Gracilaria—Frond filiform, compressed or flat, irregularly branched, the central cells large.

Hypnea—Frond filiform, irregularly branched, traversed by a fibro-cellular axis.

GENERA OF THE CRYPTONEMIA TRIBE.

Grateloupia—Frond pinnated, flat, narrow; between membranaceous and cartilaginous; structure very dense; *favellidia* in the branches; tetraspores scattered.

Gelidium—Frond pinnated, compressed, narrow, horny; *favellidia* in swollen *ramuli.*

Gigartina—Frond cartilaginous, cylindrical, or compressed; *favellidia* in external tubercles; tetraspores sunk in the frond.

Chondrus—Frond fan-shaped, dichotomously cleft, cartilaginous; tetraspores in *sori* immersed in the frond.

Phyllophora—Frond stalked, rigid, membranaceous, proliferous from the disc; tetraspores in *sori* or in proper leaflets.

Peyssonelia—Frond depressed, expanded, rooting by the under-surface.

Gymnogongrus—Frond filiform, dichotomous, horny; tetraspores strung together, contained in a wart-like *sori.*

Polyides—Root scutate; frond cylindrical, cartilaginous, forked; *favellæ* in spongy external warts; tetraspores scattered through the outer stratum of the frond.

Furcellaria—Root branching; frond cylindrical, dichotomous, cartilaginous; *favellæ* unknown; tetraspores contained in the swollen pod-like upper branches of the frond.

Dumontia—Frond cylindrical, tubular, membranaceous, of a dull red colour.

Halymenia—Frond either compressed or flat, of a gelatinous membranaceous structure and pinky-red colour.

Ginnania—Frond cylindrical, dichotomous, traversed by a fibrous axis.

KALLYMENIA—Frond expanded, leaf-like, fleshy, membranous, solid, of dense structure.

IRIDÆA—Frond expanded, leaf-like, thick, leathery, and fleshy.

CATENELLA—Frond filiform, branched, constricted into oblong articulations.

CRUORIA—Frond crustaceous, skin-like.

NACCARIA—Frond filiform, solid, cellular, the *ramuli* only composed of radiating free filaments.

GLOIOSIPHONIA—Frond tubular, hollow, the walls of the tube composed of radiating filaments.

NEMALEON—Frond filiform, solid, elastic, filamentous; composed externally of free filaments, and internally of closely-packed filaments.

DUDRESNAIA—Frond filiform, solid, gelatinous, filamentous; composed internally of interlacing filaments, forming a lax net-work; outer filaments free.

CROUANIA—Frond filiform, consisting of a jointed filament, whorled at the joints, with minute gelatinous *ramuli*.

GENERA OF THE CERAMIUM TRIBE.

PTILOTA—Frond compressed, inarticulate, distichous, pectinato-pinnate; *favellæ* stalked, involucrate.

MICROCLADIA—Frond filiform, inarticulate, dichotomous; *favellæ* sessile.

CERAMIUM—Frond filiform, articulate, dichotomous; tetraspores mostly immersed.

SPYRIDIA—Frond filiform, inarticulate, the branches clothed with minute bristle-like articulate *ramuli;* tetraspores sessile on the *ramuli*.

GRIFFITHSIA—Frond articulated, dichotomous, or clothed with whorled dichotomous *ramuli*, rose red; *favellæ* involucrated, sessile, or stalked; tetraspores sessile on whorled *ramuli*.

WRANGELIA—Frond articulated, pinnate; tetraspores scattered in the *ramuli*.

SEIROSPORA—Frond articulated; tetraspores in bead-like strings

CALLITHAMNION—Frond, at least the branches and *ramuli*, articulated, mostly pinnated; *favellæ* sessile; tetraspores sessile or stalked, scattered.

CHLOROSPERMEÆ.

THE GRASS GREEN SEAWEEDS.

1 { Fronds filamentous, articulate . . . . . *Confervaceæ.*
Fronds not articulate.

2 { Fronds composed of one continuous cell, either filamentous, simple, or densely interwoven together, or filiform and branched . . . . *Siphonaceæ.*
Fronds flattened or tubular, consisting of many-sided cells cohering together . . . . *Ulvaceæ.*

GENERA OF THE SIPHONACEÆ TRIBE.

Codium—Filaments closely combined into a sponge-like frond.
Bryopsis—Filaments free, pinnately branched.
Vaucheria—Filaments free, irregularly branched.

GENERA OF THE CONFERVA TRIBE.

Cladophora—Filaments tufted, much branched.
Rhizoclonium—Filaments decumbent, with root-like branches.
Conferva—Filaments unbranched.

GENERA OF THE ULVA TRIBE.

Enteromorpha—Frond tubular, simple or branched; green.
Ulva—Frond leafy; green.
Porphyra—Frond leafy; purple.

THE COMMON SEAWEEDS

OF THE

BRITISH COAST AND CHANNEL ISLANDS.

CHAPTER I.

The First-tide Pool.

> "Not lost the time in seaside ramble spent:
> Braced is the frame, and mental health is gained,
> Knowledge obtained of Him who made the deep,
> And blissful love acquired of Nature's works."

HERE we are at the seaside for our summer holiday—the hot and dusty city a past thing like a weary dream of the night. Our faces are cooled by the delicious breezes, our life renewed by pure fresh air; our minds strengthened by relaxation if we have worked, and soothed if by sorrow or illness we have suffered. Who does not know the strong yearning for a wandering by the seaside, the sound of the booming wave, the dash of the spray on the rock's dark side? and who that has a home full of young lives does not rejoice to see the rush out upon the sunny sands and the preparations for a seaweeding? It is for seaweed gatherers that I prepare this little book, to enable the collector to distinguish one weed from another, and interest him beyond the admiration of mere form and colour. To do so I must pray my readers to rest awhile at high tide, and, whilst the first rock-pools uncover, let me tell them somewhat of the history and structure of seaweeds.

It is childish *merely* to lay out the pretty bits on paper for an album, and be content with dabbling in the water, as ignorant as a sea-gull of the wondrous and beautiful forms around us. In fact, even as collectors for albums, it is needful to know that the value of your specimens will depend very much on their being *in fruit;* and to discern the fruit we must know where to look for it. The form and position are so various as quite to need explanation; also a pocket lens.

There are certain requirements for seaweeding and mounting with success that I had better mention at once. We want some blotting paper and some muslin —old book muslin will do very well—and some good strong white paper, cut into squares of various sizes from three inches to six inches square; we want a couple of deal boards two feet long and a foot wide, with a double strap such as we use for a rolled railway wrapper, which makes an inexpensive and handy press for the seaweeds in drying.

If you mount a few coarse needles on bits of stick, or the handles of paint brushes, or even on common lucifer matches, they will be extremely useful in laying out the weed.

A pocket lens, which may be purchased at any optician's for two shillings, will enable you not only to discern the fruit upon your seaweeds, but many other interesting things, which we shall notice hereafter.

Microscopes are so generally used by all intelligent observers of nature, they are so cheap and portable, that I shall believe my readers possess one, and draw their attention to the lovely and scarcely visible seaweeds that are parasitic on the larger ones.

Now, having these ready, we will wait until a collection has been made, when on our return home we want to preserve our treasures, and then give directions for the mounting. (See Chapter VII., p. 135).

THE USES OF SEAWEEDS AND THEIR STRUCTURE.

> "How wondrous is the scene! where all is formed
> With number, weight, and measure! all designed
> For some great end! Where not alone the plant
> Of stately growth, the herb of glorious hue,
> Of foodful substance; nor the labouring steed,
> The herd and flock that feed us; nor the mine
> That yields us stores for elegance and use;
> The sea that loads our table, and conveys
> The wanderer, man, from clime to clime; with all
> Those rolling spheres that from on high shed down
> Their kindly influence; nor these alone,
> Which strike e'en eyes incurious; but each moss,
> Each shell, each crawling insect, holds a rank
> Important in the scale of Him who framed
> This scale of beings; holds a rank, which, lost,
> Would break the chain, and leave a gap behind,
> Which Nature's self would rue!"
>
> STILLINGFLEET.

There was a time, and not very long ago, when seaweeds were the most despised of vegetable life, when professors of botany ignored them, tossed them aside as children's playthings, and only mentioned them as lowest in the scale of Creation, if not absolutely noxious.

The epicure found out, however, that one seaweed made an appetizing sauce: the Englishman calls it *laver*, the Irishman *sloke*, the Scotchman *slaak*, and the scientific man *porphyra;* but all agree in dressing it with lemon juice, spices, and butter, and like it well.

The poorer class of Highlanders and Irish eat the seaweed called *dulse*, both as food and medicine; for, like all plants, seaweed is made up of millions of small *sacs* or cells containing the varied substances it draws from sea water and sea air, one of the most important of which is iodine, a specific in all cases of scorbutic and glandular affections.

There is a common saying in Scotland, "He who eats of the *dulse* of Guerdie and drinks of the wells of Kildingie will escape all maladies except black death."

They prepare it thus in Iceland: First they wash it well in fresh water, and expose it to dry, when it gives out a white powdery substance, which is sweet and palatable, and covers the whole plant. Then they pack it in casks and keep it from the air; and thus preserved, it is ready to be eaten either in this state, with fish and butter, or, according to the practice of richer people, boiled in milk and mixed with a little flour of rye. This powdery substance is *mannite*, abundant on many of our seaweeds.

Cattle are very fond of *dulse*, and sheep will wander away dangerously far at low water in search of it. From this circumstance they call it in Norway *sousoell*, or sheeps'-weed.

The common brown seaweed fringing the rocks from highest to lowest tide is eaten with relish by Highland cows.

The most of us know how excellent for invalids is jelly made from the *carrageen* or Irish moss; and we shall find that same moss presently in our tide-pools, only with another name; it abounds on all our coasts as *Chondrus Crispus*—sold at one time as high as two shillings and sixpence a pound, because a fashionable dish for invalids.

No seaweed, however, is more useful and interesting than the very brown common seaweed, that is passed by as useless for the album, and of no beauty whatever; and yet its fructification is of the highest order, and its importance to the agriculturist so great as to render it very precious in the Channel Islands, Scotland, and Ireland.

I must, however, before taking the seaweeds separately, impress upon my readers the necessity of observing the fruit.

Their Fructification.

The basis of all our classification in Natural History is the fructification.

The Creator Himself has so outlined His plan:

> "The herb yielding seed, and the fruit tree yielding fruit after its kind, whose seed is in itself after its kind."

The trees of the forest, the flowers of the field, are not more surely classed by their blossoms and their fruit than are these pretty lowly seaweeds. It makes all the difference too in a mounted specimen—*Plocanium* for instance—whether it be in fruit or not.

Not only has a seaweed fruit, but on many species there are two kinds of fructification, and on one at least, the *Fucus,* are recognized the sexual organs, which were once supposed only existing in flowers—the perfect form of vegetable life. You will discover the ordinary forms of fruit with a simple lens, but very little of their great beauty and delicate texture without a microscope. It may be scarcely credible that a most abundant dark, unlovely weed, called *Polysiphonia,* is full of little berries, called *ceramidia,* urn-shaped, transparent, as if fashioned of delicate net-work, containing oblong brown or crimson seeds, whilst another plant close by it bears long pods containing masses of four seeds, or spores, called *tetraspores.* In my notice of *Polysiphonia* I give a drawing of these, to assist in the observation of other specimens.

If you have a microscope and examine your seaweed intelligently, always take a very small piece and place it on a glass slide with a drop of water, and a thin bit of glass over that again, else you will not be able to see what I describe. Use a low power—a two-inch object-glass is the best; then if you possess higher powers, use them one by one: the more you investigate the more you will find to astonish and delight you. Minute and unsuspected forms of *Algæ,* or seaweed parasitic on the larger ones, and so wholly microscopic as to be classed apart, and called *Diatomaceæ,* have long been a source of wonder and deep interest to scientific observers: the variety in form, the beauty of their markings it is impossible to conceive without having seen them.

We dabble in the cool, clear tide-pools, and scarcely know what we take up: there is a world of life in each. The speckled prawn is balancing himself, and waving to and fro his sensitive feelers, springing away under the rich foliage that conceals his hiding-place; and the small Blenny darts like a lightning-flash from cranny to crevice, the fear and the dread of man upon it. On the green *Ulva* creeps the lovely little slug—a bright green spotted with white—called *Acteon viridis*, and on darker seaweeds the great purplish Sea-hare. Sea-spiders lurk amid the coralline; and as we gather a bunch of seaweed, we shake out dozens of a pretty little snail called *Rissoa*, besides gathering, if we please, bright yellow Nerits, the commonest sea-snail of our coast. All these force themselves on the notice of the seaweed gatherer, as we scramble over the rocks, and pause to consider where we shall begin.

I advise taking *a little* of everything—not much, for they so soon spoil in waiting to be mounted—and name each specimen as they are decided by reference to your manual. If you have time to spare, be content to press and arrange the weeds mentioned as belonging to the first tide-pools. If you have but a day for a seaside holiday, go down to the lowest ebb of the tide, in hopes of the best *red* seaweeds, and work back to the commoner, but still beautiful, green seaweeds, *Ulva* and *Cladophoræ*.

CHAPTER II.

> "The desire which tends to know
> The works of God, thereby to glorify
> The great Work-master, leads to no excess
> That reaches blame, but rather merits praise
> The more it seems excess;
> For wonderful indeed are all His works,
> Pleasant to know, and worthiest to be all
> Had in remembrance alway with delight."
>
> MILTON.

CHLOROSPERMÆ.

GREEN SEAWEEDS.

HOWEVER much the indolent mind may dislike scientific names and classification, it will be found quite impossible to learn any part of Creation without some effort towards both; and the pleasure of collecting is increased tenfold by a knowledge of the order and the rank each little weed holds in its tiny tide-pool. There is, first of all, the division of colour—red, olive, and green; within this again, the rising scale of honour in the manner of reproduction, from the simplicity of the green seaweeds, to the complexity of the lately-known *Fucus*.

The number of *genera*, or groups containing varied individuals, is 105; the species as yet detected on the British coast may be about 380. Of these the green seaweeds abound near high-water mark, and have little variety, with the exception of *Cladophoræ*, which contains twenty species: they are very beautiful when properly laid out in a seaweed album.

Supposing we are waiting at the seaside for the ebb of the tide, and resting under the shadow of a great rock, we shall doubtless notice on the rock, just above high-water mark, small scurfy patches, consisting of minute, rigid, branching plants. These, when dry, look perfectly black, but on return of moisture exhibit a clear olive tint, while their tissues soften, and the frond becomes pliable. These patches are the intermediate link between seaweeds and lichens, and called *Lichina Pygmæa* or *Confinis.* On the rock also will be seen masses of rough shelly substance, white and ribbed, with an aperture in the centre of each cone: few seaweed collectors have failed to notice what they are—young *Balanus.*[*] Within each cone is snugly ensconced a little creature, who lies hidden and protected by a sliding panel, called *operculum*; but when the foamy waters of a full tide dashes over the rock, thousands of fairy fingers, transparent, sensitive, and feathery, wave to and fro, gathering in invisible food, and rejoicing in the abundant supply of all their needs.

We need not wait long for a tide-pool, the first uncovered will have abundance of *Ulva* and *Enteromorpha.*

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[*] The *Balanus* is one of the molluscs, or soft-bodied animals, called also *cirrhipode*, from its having feathery feet or feelers, by which it catches its prey. When first hatched from the egg, which its mother deposits in the water, the little creature is as unlike its parent as we can imagine, having a large eye, a long forked tail, and a single shell, and swimming about merrily. It moults twice, then has *two* eyes and two shells. It then seeks a pleasant spot for its permanent home, and, having decided, pours forth a strong cement, by which it fastens itself to the rock, and transforms into the animal which dwells within that shelly cone. It has now *no* eyes, but the twelve beautiful feathery feet gather in its necessary food. It reproduces itself by abundance of eggs, and contentedly lives out its little life where the hand of its Creator has placed it.

ULVA.

Generic character.—The frond (which means all parts of a seaweed except its root) is a soft green membrane, often inflated like a bladder. The name is from a Celtic word, *Ul*, *water.*

ULVA LATISSIMA—is a deep green weed, covering the stones as well as the rocks as the tide recedes, called by fishermen oyster green, because employed to cover oysters. It is also called *laver*, as it is used by epicures instead of the true laver, when *Porphyra* cannot be procured, but it is by no means so good.

ULVA LACTUCA.—Somewhat like the former; but although in its young state it is inflated or *saccate*, ere long it bursts, becomes cleft, and is of a lighter green. Both these very common seaweeds are beautiful in the album when properly prepared.

ULVA LINZA.—We may not find this in the first-tide pools, for it spreads out in delicate branches of ribbon-like folds, an inch wide, a foot or more long, of a rich bright green, tenderly green in the early summer, darker towards autumn. The fronds are waved and plaited at the edge, and the shadings produced by the curled margin add much to the beauty of this plant. It requires delicate treatment, for it is very thin, and must be floated quietly on the paper it is intended to adorn. Let the fronds spread naturally, and raise it slowly from the water; it will require little pressure, and adheres well to the paper. I have a specimen before me of seven fronds in a natural group, waved gracefully on a paper seven inches wide by a foot long, and it is one of the loveliest in my collection.

Fructification.—Minute granules arranged in fours.

ENTEROMORPHA.

This is extremely common, and varies in colour from deep to light green, differing from *Ulva* as follows:—

Generic character.—Fronds tubular, hollow, and the structure reticulated, that is, the cells are apparent as net-work, and within the cells, when in fruit, may be seen groups of three or four granules in exceedingly small and simple spots. These groups are properly called *Sori*

ENTEROMORPHA INTESTINALIS.—This name is derived from a word signifying *in the form of an intestine.* Long, tubular, varying in length and breadth from short narrow fronds, to ribbons two feet long and three inches broad; always simple, which distinguishes it from another *Enteromorpha* very much like it.

ENTEROMORPHA COMPRESSA.—This is not simple in form, but more or less branched, and varies in shape and size according to the depth of the pool and its exposure to the sun. It becomes white in decay, and the children of seaside homes call it sea-thread.

ENTEROMORPHA ERECTA.—This is the finest of the *Enteromorphæ*, but usually grows in deep water, and is not particularly desirable for the collector. If amongst the weeds cast up by the storm, it is observed of a rich dark green.

MYRIONEMA STRANGULANS.

(Name from the Greek, signifying "numberless," and "a thread.")

This is a microscopic seaweed. I notice it because it is so common, and so entirely overlooked by collectors, except as a nuisance, spoiling the *Ulva* and *Enteromorpha*. Yes—it surrounds the one and spots the other with apparent decay; yet, if one of those brown spots be placed under the microscope, we shall see a soft cushion of jelly-like substance full of dots, and the dots are the tips of beaded filaments. If we bruise the mass, or make a section, we shall find large pear-shaped spores rising from amidst the filaments. Exceedingly beautiful is this object, and a valuable lesson on the advantage of minute observation. The hour of waiting for the receding tide has ample work and pleasure for those who possess a microscope.

CONFERVA.

Floating or attached, we find this as a mass of thread-like substance in the tide-pools mostly at high-water mark, for the family is a large one, and belongs equally to fresh water ponds and brackish ditches.

Although placed in the lowest ranks of *Algæ*, the manner of its fructification is very interesting, and leads me to speak of the three kinds of reproductive bodies we are apt to confound in one word, *seed.*

Seeds are produced only by flowers of highest rank, and always contain an embryo, which is nourished by more or less albumen, a provision stored up in the cells of the seed, for the use of the little plant whilst in the earth.

Spores are seeds without embryo, and develope in quite a different way, multiplying cells into a broad expanse or green film, out of which arise male and female organs, called *antheridia* and *archegonia*, which can only be seen with a good microscope.

Zoospores belong to what we are seeking—*Conferva* of all kinds. They are minute bodies formed between the joints, which, when perfect, are ciliated or edged with fine hair called *cilia*, and this hair moves like so many little paddles, causing the zoospores to swim out of its cell, and, after whirling about for awhile, to fix upon the spot where as *Conferva* they will grow. Bearing this interesting fact in mind, gather any loose green threads, and lay them out: examine them with the microscope, when they will appear as coils of lovely variegated green ribbon.

Generic character. — Filaments green, jointed, attached or floating, unbranched.

Observe this latter qualification, because it alone will distinguish it from an *Algæ* extremely like it called *Cladophora*, a *Conferva*-like plant, but branched in various ways, common in all tide-pools from high-water mark, to the deepest pool at lowest ebb.

CLADOPHORA.

(The name means "branch-bearing.")

Cladophora Rupestris. — It is a plain-looking plant, closely tufted, and of dirty greyish-green colour; nevertheless, if taken from the deeper pools at half-tide, it is truly a beautiful plant of a fine dark green, and very useful to collectors for fancy work, as it dries well on the muslin or calico, and is very effective when mingled with red seaweeds and zoophytes.

Cladophora Rectangularis.—This species and those which follow are found as you track the tide to low-water mark. By examination with a pocket lens, you will see the difference between this and *Cladophora Rupestris.* In the former, the branches are set on the stem at an acute angle; here they are very nearly at right angles, with minute branchlets between the larger ones. The deep sea casts this up on the Irish coast so abundantly that it has been carted away as manure, whereas it is very rare in England, and again more plentiful in Guernsey, where I have found it often in *Zostera* beds at low tide.

Cladophora Arcta. — About half-tide level to low-water mark, and most abundant in the spring and summer, we find very dark glassy-green tufts attached to the rocks, with silvery, silky tips, glistening in the water. Take it by all means: it adheres well to paper, and long retains its beauty.

CLADOPHORA PELLUCIDÆ.—This grows in tufts from four to six inches high: rigid erect filaments, forked, and with bunches of little branches on the older stems, which distinguish the plant. Sometimes it is wearily difficult to a young botanist, the discerning of *species*, but this one requires only the observation of the forks at the tips of filaments; the long cells reaching always from joint to joint; and its general rigid, wiry nature.

In drying it fades and does not adhere well to paper. This is most common in the south of England—Yarmouth, Falmouth, Isle of Wight, Channel Islands.

CLADOPHORA DIFFUSA grows on rocks in grass-green or dark green tufts, so rigid as to bristle up when taken from the pool. It adheres but not strongly to the paper; and observe the number of small cells in the stem between the branches, also that the branches are distantly placed, and not by any means numerous.

CLADOPHORA LANOSA.—This specimen will teach you not to despise small tufts growing upon other common coarse seaweeds, such as the *Fucus*, on every rock, even at high tide; for if you examine small yellowish silky tufts upon the stem, you *will* obtain this *Cladophora*, and a variety of other more beautiful seaweeds which I will describe hereafter. I do not recommend this species for the herbarium, as it fades so much in drying, and loses its gloss, but it is worth observing with a lens or microscope.

Cladophora Gracilis.—This is a lovely plant. Long, light, green, silky filaments, from six to fourteen inches long, float out into the pool, growing on other seaweed, especially on *Zostera* or sea-grass. Observe the branchlets, comb-like on one side of each larger branch: *that* is a distinctive mark, together with its glossy soft hue and silky texture.

FUCUS.

This seaweed extends from high-water mark to lowest tide, and belongs to the olive seaweeds or *Melanospermæ;* so called because the reproductive grains or spores are very dark coloured, nearly black when seen by transmitted light. We are so much accustomed to see the vast expanse of rock uncovered at low tide, clothed with heavy brown masses of coarse-looking weed, that the young collector is apt to pass it all by, as useless for the album, and of no particular value to any one.

This is a great mistake. Beneath those clustering masses of *Fuci* we find our greatest treasures, in delicate small *Algæ*, shadowed and sheltered thus by the coarser weed. Various names are given to this brown seaweed—sea-ware, bladder, *Fucus* (its proper name), kelp-ware, black tang, Lady-wrack, or "Our Lady's wrack," from the richness of the crop it yields to the seaside agriculturist. On the Ayrshire coast the farmer and cottager vie with each other in raking up the black tang from the stormy sea; the poor Irishman depends on the harvest of weed for manure for his potato field. In the town of Galway, some years ago, it is related * that cargoes of this weed were brought from Slynehead, distant between fifty and sixty miles, and that some of the purchasers were, for purposes of manure, about to convey it inland thirty miles or more.

It is gathered for the same purpose all along the British shore; but nowhere more industriously than in the Channel Islands.

The people of Guernsey and Jersey call it "vraic," a corruption of *varec*, the French word for seaweed. So important is the matter, that the seasons for cutting and collecting are appointed and limited by law.

The seasons are two, usually from the 10th of February to the 15th of March, and from the 22nd of July to the 31st of August.

When vraicking season has come, families join, and sally forth from all parts of the island to cut the vraic from the rocks. Armed with reaping hooks, the legs protected by strong shields of leather, the men wade deep into the water, the women following as far as they can go, and cut away the weed, which is raked into carts and carried up beyond tide mark: many go in boats to distant rocks, and bring heavy loads ashore. Boys and girls work away in carrying *bings* full—or basket loads—ever and anon getting refreshment of vraicking cakes, and cold tea, or gin, or cyder; but still so eager at the work that many a time the good

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* "Annals of Natural History." By W. THOMPSON.

Guernsey horse has to swim, and the cartload floats on the bosom of the inexorable tide which waits for no man.

Out of the cutting season there is still a vraicking always more or less going on. After every gale of wind, the waves cast up the *Fucus* they have torn from deep sea rocks, and women and children rake it in, spread it on the sandy or shingly shore to dry, then stack it for winter fuel, the ashes of which is the best manure of all for fields under crop. Fresh vraic is laid on as top-dressing for fallow ground or green pastures.

In the Hebrides, cheeses are dried by being covered with the ashes of this plant, which abounds in salt. In the Highlands, during snow-storms, the red deer descends from the wild mountains to the shore, to feed on this seaweed. The vesicles, which are full of a glutinous substance, are most valuable, both as a remedy for glandular affections, and, when bottled in rum, as an embrocation, really efficacious in rheumatic pains, and for ricketty or bandy-legged children.

For glandular swellings, the plant is burnt to a black powder, and taken inwardly.

We now come to the botanical description of the plant and the number of its species.

The four common *Fuci* on our coast are

Fucus Nodosus,	*Knobbed Wrack.*
Fucus Vesiculosus,	*Bladder Wrack.*
Fucus Serratus,	*Serrated Seaweed.*
Fucus Caniculatus,	*Channelled Seaweed.*

Generic character.—A flat, brown, leathery frond, branched, and abounding with air vessels. The fruit is usually at the tips of the branches, swollen terminations yellow and slimy, full of dots or pores by which the seeds are expelled. The manner of fructification is so interesting, and raises this seaweed so high in the ranks of vegetable life, that a longer description will be useful to those who possess a good microscope, and will be given presently

Take these three abundant weeds as an easy lesson in the observation necessary to the determining what seaweed you have in hand

Has the brown seaweed a *mid-rib ?* then it must be either *Fucus Serratus* or *Fucus Vesiculosus.* But the *Bladder Wrack* has long fronds from two to three feet long, the air vessels as large as nuts, *in pairs,* the fruit pods or receptacles also in pairs, and often forked or heart-shaped.

The *Fucus Serratus* is toothed or scolloped at the edge, and both sides are dotted with pencil-like clusters of fine white hairs ; besides which, the frond is often covered or spotted with the most delicate lace-work, which is the work of a tiny zoophyte with a very long name—*Membranipora :* each mesh of that fairy-like work was the dwelling of a perfect zoophyte ; and this patch of silvery lace is a city of the dead—the habitations empty ; and when the bright waves close over them, they become crystal caves, where minute Crustaceans play or Infusoria hide. We cannot easily mistake between these two.

If the *Fucus* has *no mid-rib,* it must be either the *Knobbed* or the *Channelled Wrack.*

FUCUS CANALICULATUS, or *Channelled,* is found at high-water mark, and seldom if ever grows below half-tide.

It grows indeed where the spray of the tide just reaches it, and seems to require exposure to the air for many hours a day. True, it becomes black and crisp under the fierce rays of a midsummer sun, but upon immersion in the up-coming tide it regains life and flexibility. The furrow in its stem, its having no air vessels, and the dense or thick tufts from two to six inches high, will sufficiently distinguish this from its robust brother,

Fucus Nodosus, which floats out on the water without a mid-rib also, but buoyed up by large air vessels placed singly *in* the stem, which varies from two to four or six feet in length. The frond is jagged; and the fruit, which is olive green or yellow, according to its contents, is an oblong pod upon a stalk set always in a tooth of the frond.

Observe, the vesicles or air cells are in the very substance of the frond, and sometimes as much as two inches long: boys in Scotland make whistles of them by cutting them across near the end. This is quite the largest British species of *Fuci*, rigid, tough, and in thick tufts; but, like all seaweeds, its growth and appearance depend upon it position. I cannot too much impress upon young seaweed gatherers this important and often tiresome fact, that a plant may be short and bushy in high-tide pools, and long, strong, and thin at low-water mark; even the very colour changes as it lives more in the richer soil of the deep sea. It is really the same difference that we find between the flowers of the field and the flowers in the garden. Those growing on a barren soil, removed to a light rich earth, will expand into larger flowers with brighter hues. Just so and *more so* with the sea-weeds. There is one "pestilent fellow"—*Ceramium Rubrum*—who presents at one place the most delicate ladylike appearance, quite a "lovely bit" in the album, and at another place he is the coarsest, ugliest of ragged rascals: we fling it away, and won't believe that it is even related to the specimen we look for.

PARASITES ON FUCUS.

We have now observed and learnt the four species of *Fucus* that cannot fail to attract our attention as we walk between the tide-pools. In so doing we have noticed the zoophyte *Membranipora*, and, doubtless, those little white bristles which zigzag up the stem or creep along the frond: they also are zoophytes—cities of the *Sertularia*. Every notch on the bristle is the home of one lovely little creature which, when in the water, rises up, flinging forth twelve sensitive feelers, that catch its food, and the whole bristle becomes a spray of stars; in daylight pearly white and flower-like stars; but at night every star flashes out phosphoric light, and the bristle is a wreath of illuminating lamps to the living creatures of the great deep.

Fructification of Fuci.—For those who possess a microscope an examination of the pod-like receptacles will amply reward them; and we give an extract from "Objects for the Microscope,"* which is not difficult to understand and test.

In *Fucus Nodosus* the fructification is divided. The *antheridia* or male organs are on one plant, the *archegonia* or female organs on another; therefore it is best to take *Fucus Serratus*, which has them both together, the one olive green, the other orange yellow, on the same frond, and, if possible, between the months of December and April.

Choose a mature receptacle, which may be known by its discharging little gelatinous masses adhering round its orifice. Make a section through it, and you will see a globular cavity lined with filaments, some of which project through the pore. These filaments are jointed, or rather are composed of cells containing what are called *antherozoides.* These are yellow dots with two long thread-like appendages, which, when liberated by the breaking of the cell, have a spontaneous and rapid motion, and they immediately swarm around the *sporangia,* and fecundate them. The *sporangia* are pear-shaped bodies lying amongst these filaments near the walls of the cavity, and they are the parent cells of the germ cells which produce the spores or seeds. Each of these *sporangia* gives forth a cluster of eight cells, and are therefore also called *octospores.*

In the hermaphrodite *Fuci* the spores do not leave the receptacle until after their fecundation; but in *Fucus Vesiculosus*, which is a *diœcious* plant, the *anthe-*

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* "Objects for the Microscope." By L. LANE CLARKE. Groombridge.

rozoides meet the spores in the water directly after they issue from the receptacle.

To observe this, take an olive green receptacle, which is the female, and set free a few spores in a drop of sea water in a shallow cell; then liberate a few ripe filaments from an orange yellow receptacle, which will contain the *antherozoides,* and the whole process of fertilization may be watched with a power of 250 diameters.

Then, if you wish further to prove the subsequent process of germination, a little care and patience will enable these very spores to grow from the cell of what is called a "growing slide," or even in a tumbler of water fresh and *still,* by drawing it off with a siphon, and renewing it daily in the same gentle way.

ELACHISTEA.

(The name seemingly from a Greek word signifying "the least." They are all parasitic plants.)

Elachistea Fuciola. — This is a parasitic plant of no use to the collector, but very interesting to the microscopist. It is found as small olive-coloured tufts on *Fucus Nodosus* and *Fucus Serratus;* triple-jointed filaments, with stalked spores affixed to the base of the filaments.

Elachistea Flaccida is found on *Cystoseira.*

Elachistea Stellulatæ is parasitic on *Dictyota.*

Elachistea Scutulata on *Himanthalia.*

Elachistea Velutina also on *Himanthalia.*

Elachistea Pulvinata on *Cystoseira.*

ECTOCARPUS LITORALIS.

(Name from the Greek, signifying "external" and "a fruit.")

We cannot examine a *Fucus* without noticing the tufts of brown, shaggy filaments, from six to twelve inches long, which hang on the frond. This is a seaweed of wide range from highest to lowest tide, infesting the mighty *Laminaria* of the deep sea: it dries a soft silky brown, and adheres well to paper. If we prefer a good green to its natural colour, dip it for a moment in boiling water, and it comes out a pleasant grass green.

There are fourteen species of *Ectocarpus*, parasitic on various plants; for instance, the pencil-like tufts on *Ptilota Sericea* and *Rhodymenia* are rarer kinds; *Ectocarpus Sphærophorus ; Ectocarpus Bracliatus ;* whilst the common *Cladophora Rupestris* is often intermingled with *Ectocarpus Siliculosus.*

The generic character of Ectocarpus is olive or brown thread-like tubes, jointed, flaccid, growing in tufts upon other seaweeds, sometimes growing on the mud of a low sea coast.

Fructification.—Spore-cases of various shape, spherical, lanceolate, or imbedded in the branches, which necessitates the use of a microscope to decide the species and enjoy the beauty of this common weed; for instance,

ECTOCARPUS SILICULOSUS, which makes a beautiful specimen on paper, is only distinguished by its fruit from one that may be growing on the same *Fucus*, and resembling it so nearly as to be mistaken for it. Upon closer examination, even as we float it out on paper, we shall find the fruit of *Ectocarpus Litoralis* as a thickening of the filaments in bands of darker colour, and striped; whereas the fruit of *Ectocarpus Siliculosus* consists of pod-like spore-cases on stalks, olive green, striped, tapering to a fine point.

ECTOCARPUS MERTENSII is a charming little plant gliding into relationship with another tribe, *Sphacellaria*, found at low-water mark on mud and stones: it may be recognized by its pretty fruit, a small pod divided into two chambers by a transparent line, and set in pairs on either side of the *ramuli*. South coast of England, Ireland, Channel Islands.

ECTOCARPUS GRANULOSUS is a handsome plant, and is frequent on larger seaweed, dotted abundantly with round fruit, which is quite visible to the naked eye.

ECTOCARPUS SPHÆROPHORUS, parasitic on *Ptilota Sericea* and *Cladophora:* soft, brownish-yellow tufts from one to three inches high, with fruit in pairs, and like dark olive berries, with pellucid border, seated on the *ramuli*.

ECTOCARPUS TOMENTOSUS, parasitic or *Fucus*, and unlike all its family in the texture of its filaments. When out of the water it is a brown matted spongy mass. Floated out, it is beautifully feathery, and the filaments clothed with transparent *cilia*; the fruit in small pods at intervals along the branches. Common everywhere.

POLYSIPHONIA.

(Name from two Greek words, signifying "many siphons.")

As I am not writing a scientific work, but simply a useful hand-book for the seaweed collector, I must pass from *Fuci*, or olive green seaweeds, to one which belongs to *Rhodospermæ*, or red seaweeds, because it will be the very first to arrest attention, and raise a question, "Is this worth gathering?"

We cannot fail to observe on the fronds of *Fucus* or old-cut stems of the *Fucus Vesiculosus*, thick masses of brownish or purplish weed, hanging in dense tufts here and there. Gather some by all means—it is a *Polysiphonia.*

These seaweeds are some of the hidden beauties of Creation. How could we with the unassisted eye see aught that is lovely in those dark purple, or olive-brown tufts, growing so abundantly on the common *Fucus* everywhere? The tribe of the *Polysiphonia* is large and various; it spreads from high to low tide; some very small and delicate, or long and filmy, and the colour from brown to violet in every intermediate shade.

Twenty-four species are found in Britain. (See systematic list.)

Generic character.—Frond thread-like, partially or generally articulate; the joints are striped, because the stem is composed of parallel tubes or siphons, from whence its name—*poly*, many; *siphon*, tube. The number of these tubes varies in the species, and helps to determine them.

Fructification.—Twofold on distinct plants:—1.

Ovate capsules or cells, containing pear-like spores. 2. *Tetraspores*, or clusters of four spores, imbedded in swollen branches.

POLYSIPHONIA FASTIGIATA (Tufted Polysiphonia).—This is the first we shall meet with, and never appreciate unless we have a microscope, for it simply dries black and occupies a careless corner of the album, passed over as a weed and nothing more, of no great importance either. I would therefore beg of you to take a small piece of any you see in fruit, that is, with swollen tips, and place it on a glass slide, with a drop of water, covering it with a bit of thin glass. I repeat this, because if the weed be laid on dry and loose, we see nothing; the water renders it transparent, and the pressure of the glass exhibits the structure of the substance.

We see now the rows of tubes or siphons which give the name to the plant; short rows of about sixteen tubes: the joints are short, and in the centre of each is a *sac*, or cell, of coloured matter, which makes a dark spot, and will help to distinguish it from other species. The swollen tips will show an urn-like cell, supported by a short horn at its side; the texture of the cell is transparent, and on slight pressure the pear-shaped spores will probably come out. If we take a neighbouring plant, the tetraspores will be found embedded in smaller branches near the fork, and irregularly placed. In winter a new kind of fructification appears—yellow oblong bodies abound at the tips of the *ramuli*, and give the whole plant a yellow hue. This is not thoroughly understood.

What I have said may render this common *Polysiphonia* more interesting, so will all examination of these flowers of the sea. The more carefully we compare the varieties the more beauty we shall find—perfect order and harmony, with adherence to a given plan, which has enabled the human observer to class and comprehend the works of the Almighty Creator.

Whilst reading this and gathering the seaweeds of the first-tide pools, the waves have retreated, silently uncovering the mid-tide rocks, or flinging bright foam into the crevices and pools as they playfully ebb out to their utmost bounds.

Step by step as we follow them, richer treasures will be gathered: we shall learn to lift the upper tangled mass of coarser weed, and look into crannies of the rock, especially on the north or shady side. We have learnt already from the tiny *Myrionema* and the little tuft of *Ectocarpus*, not to despise small and common things, therefore we are awakened to fresh interest, and more capable of appreciating what the mid-tide rock-pool will now offer to us.

CHAPTER III.

The Half-tide Pool.

> "Countless laughing gleams of deep-sea weeds."

> "When up some woodland dale we catch
> The many-twinkling smile of ocean,
> Or, with pleased ear, bewildered, watch
> His chime of restless motion;
> Still, as the surging waves retire,
> They seem to gasp with strong desire;
> Such signs of love old ocean gives,
> We cannot choose but think he lives."
>
> *The Christian Year.*

We come to richer ground, and are likely to find the following weeds:—

Ceramium.
Polysiphonia.
Chylocladia.
Desmarestia.
Padina Pavonia.
Ptilota Sericea.
Laurentia.
Hypnea.
Griffithsia.
Chondrus.
Asperococcus.
Dictyosiphon.
Mesogloia.
Rytiphlœa.
Halidrys.
Dumontia.

All of them such mimicry of flower life as delight the collector, and tint the pages of the album with shades of colour from deepest purple to the rosiest red; and, in *Padina Pavonia,* the iridescent hues of changeful green, grey, purple, we scarcely determine which when seen beneath the water.

CERAMIUM.

(Name from a Greek word, signifying "little pitcher," in allusion to the shape of the fruit—which it never does resemble.)

Probably the first weed that attracts the eye will be a *Ceramium*, and these are the marks by which you will recognize it.

Generic character.—Thread-like, jointed, branched, with repeated forkings. The tips of the filaments are always forked, and often curl towards each other, which is a striking peculiarity, and seldom absent, except in some very old rigid plants of *Ceramium Rubrum.* When examined with a lens, the substance of the filaments appears like net-work, pink and white, the joints more or less transparent, and the intermediate portions are opaque.

Fructification.—This is of two kinds:—1. Berries or capsules containing seeds, and called *favellæ.* 2. Tetraspores, or groups of four seeds, immersed in the substance of the branch, and surrounding it in a whorl.

CERAMIUM RUBRUM (common Red Ceramium).—As I said before, a most puzzling plant: sometimes delicate rosy red, a very prize for the album; sometimes so coarse as to be flung aside as a worthless weed. Nevertheless do not throw any away, because on large coarse tufts we often find very pretty parasitic plants.

The tips of the filaments are forked, but do not curve inwards—rather curve outward; and the fruit is a berry, surrounded by four short branches, or a number of tetraspores (little red dots, each containing *four* tiny seeds), which circle a swollen branchlet, and give the plant a beautiful bright red appearance. It is common everywhere, and in all tide-pools.

CERAMIUM DIAPHANUM.—This is very lovely, and found parasitic on other plants, or in shallow pools resting on the sandy bottom; about three inches long, and the tuft feels soft and silky. When floated on the paper, we see its beautiful texture of transparent white, stem with rosy red joints, and if in perfection, with deeper red seeds in a swollen joint, three in each cell; or with three bright berries supported in a cradle of short branchlets, near the tips of the filaments.

Habitat.—On rocks and seaweeds. Winter and summer.

CERAMIUM CILIATUM (Hairy Ceramium).—This is very like the former in delicate structure, transparent, with purple-red joints; but observe the hairs upon each filament, because their size, position, and number will decide the following species, all of them more or less hairy. Here we see the hairs form a *regular* row of prickles, all *pointing upwards.* This is common in summer, but dies away early in the winter; we find it chiefly as a parasite on smaller *Algæ.*

CERAMIUM ECHIONOTUM (Irregularly-spined Ceramium).—Dark red or purple tufts of jointed filaments; will show the hairs to be *irregularly* scattered round the joints, and *very slender*, needle-shaped. This is found parasitic on *Algæ* in the tide-pools, and is an annual. Common on the south coast and in the Channel Islands.

CERAMIUM ACANTHONOTUM (Spined Ceramium).—This weed grows in dense dark purple tufts, from two to six inches in length; the filaments are as fine as human hair, excessively branched, so as to be all of a tangle, and difficult to float out clearly. The joints beautifully transparent, with richly-coloured intermediate parts; and *the* distinctive mark is a strong, single, but three-jointed spine on the outside of every filament. The forked tips curve inward most decidedly; the fruit is either the usual whorl of tetraspores (four seeds in a cluster), or a *favellæ*—a cell containing many spores, which, instead of nestling in a tuft of branchlets like most other species, sit on the curved arm of *one* protecting *ramulus* or short branch.

It is a common plant on the north coast of Britain, on half-tide rocks covered with young mussels: it seems to like to live amongst them.

CERAMIUM BOTRYOCARPUM (Grape-fruited Ceramium).—The distinguishing mark of this seaweed is its fruit, which grows in clusters, with merely a few short branches like a fine-rayed star beneath the cluster. It is in perfection in June and July, but disappears in September. This *Ceramium* is less branched and the forks more indistinct than in other species, neither do they curve inwards. It is very plentiful between tide marks on the south coast of England, and in the Channel Islands, also on the Ayrshire coast.

CERAMIUM GRACILLIMUM.—This is only found in the lowest tide-pools. See Chapter V., as also

Ceramium Fastigiatum.
Ceramium Strictum.
Ceramium Nodosum.

MESOGLOIA.

(Name from two Greek words, signifying "viscid" and "middle.")

Generic character.—Thread-like frond, composed of loosely-packed filaments, invested with gelatine. The radiating filaments of the axis terminate in clusters of club-shaped, bead-like fibres.

Fructification.—Obovate spores, seated among the terminal fibres.

MESOGLOIA VIRESCENS.—The soft shiny fronds of this plant will help to recognize it. It is of a light pretty green, the stem much branched, and it adheres well to paper, making an excellent specimen. If examined with a microscope, the texture is truly beautiful: the filaments are composed of little cells, strung like beads in tufts, and joined to a main row of cells; at the base of the tuft spores are visible, dark olive dots with a pellucid border.

MESOGLOIA VERMICULARIS — is not so good a species for the collector as for the microscopist: the fronds are coarser, the colour a muddy olive or yellow, the substance flaccid, and the form clumsy; but the fruit is most curious. At the tips of the branches a spore is seated, dark olive green in a pellucid cell, surrounded by filaments of gradually increasing round cells, ending in a knob, and giving a singular appearance to the tuft.

These are both common in all tide-pools, from high to low water mark.

DUMONTIA.

(Name in honour of Mons. DUMONT, a French naturalist.)

Generic character. — Frond from one to twenty inches in length, a hollow tube filled with watery gelatine, simple, rarely branched, of a red or purplish-red colour.

Fructification.—Groups of spores attached to the inside of the membrane of the frond.

GELIDIUM.

(Name from *gelu*, frost, whence also gelatine; and yet, says HARVEY, not one of the species is *gelatinous!*)

A most difficult plant is this to describe with any accuracy. It abounds in all our pools from high-water mark to extreme low tide, and yet is so unlike itself in various pools as to puzzle the collector exceedingly. When I first found the charming little rosy red *Gelidium*, with a flat frond edged all round with *pinnæ*, I scarcely believed that I had the same plant as the filiform greenish-red *Gelidium Flexuosus*, with its forked branchlets and recurved *pinnæ*.

Generic character. — Frond rather horny, flat, branched; branches linear, pinnate, or bi-pinnate.

Fructification.—Two kinds on distinct individuals. Capsules containing spores immersed in the extremities of the *ramuli*, or tetraspores simply imbedded in the club-shaped branchlets.

The size varies from one inch to six inches, and the plant hides under other seaweed, in some of its many forms, on all our coasts. Colour, red and reddish-green.

POLYSIPHONIA.

(Name from the Greek, signifying "many siphons.")

The *generic character* of all the *Polysiphoniadæ* is given with the commonest species, *Polysiphonia Fastigiata*, in the first-tide pools; but now as we advance towards the deep sea many beautiful varieties may be collected, and none are more worthy than

POLYSIPHONIA VIOLACEA.—A splendid violet seaweed, from six to ten inches long, with a principal stem and a multitude of smaller branches, like a tree; if in fruit, dotted like a well-laden plum tree, with *ceramidia*, or urn-shaped cells, or tetraspores in bead-like rows on branchlets. Four siphons are in the stem, and the skin is full of irregular violet cells, which partially conceal them. This is a distinguishing mark: also observe the tufts of thread-like fibres at the end of the branches.

It grows in all mid-tide and low-tide pools.

Polysiphonia Urceolata (the Hair-like Polysiphonia).—On the stems of *Laminaria Digitata,* large tufts of this seaweed may be found, varying in length from three to nine inches; colour, a dark red. Here the pretty seed vessels, instead of being at the tips, are seated on branches, singly—lovely little urns of transparent rose-coloured cells, in which we see oblong bodies of deeper hues; and by a little gentle pressure the urns will open their mouths, and the spore-cases come out; or, if the fruit be tetraspores, we shall find it in single rows at the tips of the *ramuli* or short branches. Again, we observe only two siphons visible in the stem, for it contains but four, whereas in other species there may be as many as twenty. Of course all this is only seen with a microscope, but one of very moderate power will exhibit these beauties; whereas simply dried on paper, this *Polysiphonia* is black, and hardly to be distinguished from *Polysiphonia Fastigiata.*

Poysiphonia Nigrescens.—This is found in mid-tide pools, on rocks or the larger *Algæ,* and is very abundant everywhere in summer. Spread out upon paper, it is long and bushy, quite black, the stems rather bare towards the base. Under the microscope we have the example of a stem containing twenty siphons: the *ceramidia* or seed vessels are seated closely on the stem, and the tetraspores are found on separate plants imbedded in smaller branchlets, which have often thread-like processes at the tips. If examined in the autumn, this plant is sometimes yellowish, and full of oblong yellow bodies called *antheridia*, a part of its fructification.

For other *Polysiphonia*, see "Low-water Mark."

RYTIPHLŒA.

(Name from "wrinkle," and "the bark," in allusion to the appearance of the surface when dry.)

This is allied to *Polysiphonia*, and resembles it in having the same kind of fruit, that is, *ceramidia*, or urns containing spores; tetraspores not only in swollen branchlets, but also borne in little leaflets called *stichidia.*

Generic character.—Frond thread-like or compressed, pinnate or divided into smaller branches, striped across, and skin reticulated or like net-work.

RYTIPHLŒA THUYOIDES.—This is found in pools, both mid-tide and low water, in tufts from three to six inches high, of dark brownish-purple in the water, drying to an olive tint on paper, to which it does not well adhere. This seaweed grows in shallow pools, and is frequently left dry by the tide. It is extremely like *Polysiphonia Nigrescens*, but the least morsel seen under the microscope will reveal the difference. In this plant the internal siphons are wholly concealed by the external cells.

Abundant in the Channel Islands, Devonshire, Ilfracombe, Weymouth, and west coast of Ireland.

RYTIPHLŒA FRUCTICULOSA. — This is most abundant in mid-tide pools, and prefers sand-covered rocks and shallow water. It is very easily recognized by its distinct pencil-like branchlets, set at regular distances on the main stems, the tips of which retain a drop of water on raising it from the pool. The *Ceramidia* are very abundant on the branches all through the summer, and the tetraspores in distorted *ramuli* or short branches. The tufts of this weed are often six inches in diameter, and, when floating out in the pool, the tips of the *ramuli* are yellowish and glutinous. Under the microscope we see dark crimson stripes marking the joints, yellowish transparent cells, and longitudinal markings. The *ceramidia* are yellowish, with crimson spores.

RYTIPHLŒA COMPLANATA. — This is considered a treasure, not for any particular beauty, but because it is rare. Look for it on *Corallina Officinalis.* Small fronds only two or three inches high; branches with acute axils; the stems *flat,* and colour dark brownish-red. It prefers the shallow sandy pool and full blaze of the sun.

RYTIPHLŒA PINASTROIDES, or HOOKED RYTIPHLŒA.—This is a larger species, coarse, and frequently encrusted with the lovely zoophyte *Membranipora*

Pilosa, also grows in company with *Plocamium;* and if dried together in the album, they make a very pretty page.

We do not find this plant either in Scotland or Ireland, but in the Channel Islands and on the south coast of England, and easily recognize its rigid hooked branchlets and scattered fruits, also the jointed appearances when fresh, even with a pocket lens. It prefers the deep sea, and is often thrown up after a storm, when, as in a specimen before me, it is nearly covered with zoophytes and *Melobesia.*

CHYLOCLADIA.

(Name from Greek words signifying "juice" and "branch.")

If you have got either to a deep mid-tide pool, or are walking on the sands at *half-tide,* where rocks are left dry, and break into little chasms, or overhang one another; look into the clefts, and doubtless you will find dark purple bunches of *Ptilota Sericea* mingling with *Chylocladia* in pale red or transparent purple tufts; also *Griffithsia* — rich rosy-red: two common species in the same place, all hanging high and dry in company with Sponges, Limpets, *Balanus,* Periwinkles, and *Trochi* or Tops. The cleft of a half-tide or low-tide rock is a very mine of wealth to the seaside naturalist. At Shanklin in the Isle of Wight, and numberless bays in Guernsey, Sark, and Jersey, the crevice of one rock will give a good morning's work.

CHYLOCLADIA ARTICULATA.—(A name signifying a *juicy branch.*)

Generic character.—The frond tubular, constricted strongly throughout as if jointed, much branched, tufted at the tips of the main branches.

The constrictions are full of watery fluid; colour pale red or purple; and the plant varies in size from one inch to six or eight inches long, sometimes even twelve inches long, when cast up from deep water.

Fructification of Chylocladia: ceramidia either spherical, oval, or conical.—On this species the spore-cases are transparent, conical, opening by a minute pore, and enclosing many crimson seeds. Tetraspores are the most common kind of fruit, immersed in the stem, and giving a dotted appearance to the joints.

CHYLOCLADIA KALYFORMIS (Salt-wort Chylocladia).—This is a beautiful specimen for the album. It dries well on paper, though staining it a bright red from the rupture of its tubular branches. The colour is often greenish and yellowish in the stem; and when growing in shallow tide-pools, exposed to a bright sun, it is quite yellow. It grows at various depths and in different situations, on rocks or on sand, as may be. The fronds are frequently twelve, or even twenty inches long, with spreading branches and bead-like joints. The fruit is a round berry without obvious pore, and with a wide transparent margin, containing many crimson pear-shaped spores: this alone would decide the species. Tetraspores are scattered thickly in the joints of the *ramuli* or *lesser* branches. In both these particulars, compared with *Chylocladia Articulata,* the distinction is obvious.

Found from June to August, all round our coasts.

CHYLOCLADIA PARVULA.—A small species, much resembling *Chylocladia Kalyformis*, and may be recognized by its growing parasitical on other plants; also from the shape of its fruit, which is ovate, not spherical. Colour a pinky-red. Height from two to three inches. Found in deep rock-pools near low-water mark.

CHYLOCLADIA OVALIS (Oval-leafed Chylocladia).—This is a very pretty specimen, but to have it in perfection, seek it in the months of April and May, on rocks and stones within tide marks. There is a difference in its structure that will help the collector in naming it. The stem is *not* jointed, but solid; from two to ten inches high, and edged with oblong leaf-like little branches: some of these appear to be single cells, some are compound and set on little stems, like leaves; if divided length-wise, these joints are seen to be hollow chambers partitioned off by one or two membranes, and filled with fluid.

CHYLOCLADIA REFLEXA (Arched Chylocladia).—This is rare, and properly belongs to low-water mark; but as it is the last species we shall name, there is no need of separation. The collector will bear in mind that if he desires to make his collection perfect, and seeks this *Chylocladia*, it must be on rocks in the sea at lowest ebb of the tide. It is small, and has a creeping habit; sending out *arched* zigzag branches with little feet or discs, which adhere to the rock like suckers. This alone will enable us to secure a rare plant, found hitherto only on the north coast of Devon, coast of Normandy, and Channel Islands.

PTILOTA SERICEA.

(SILKY PTILOTA.)

(*Ptilota* from a Greek word signifying "pinnated.")

In company with *Chylocladia* under the hanging rock is this beautiful feathery seaweed: its sister-plant *Ptilota Plumosa*, more rare and lovely, is found at lowest-water mark, or cast up after a storm.

The texture of this seaweed is worthy of microscopic examination. The frond is not jointed, but the branches which divide and subdivide are composed of minute cells filled with pink fluid, and with transparent divisions: the fruit is often abundant. *Favellæ*, or large cells having a dense mass of spores within them, are found at the tips of the branches, generally only two of them, partially sheltered by short branches. Tetraspores are found in rows upon the *ramuli*, little dots of white cells enclosing red spores.

GRIFFITHSIA.

(Named in honour of Mrs. GRIFFITHS, of Torquay, Devon, whose many discoveries in and intimate knowledge of seaweeds are well known in the scientific world.)

A most valuable family of seaweeds for the collector's album. There are seven species.

Generic character. — Frond rose-red, thread-like, jointed slightly, branched, sometimes whorled, and the joints transparent.

Fructification.—1. Roundish gelatinous receptacles or *favellæ* containing minute spores. 2. Tetraspores, affixed to whorled *ramuli* or lesser branches.

GRIFFITHSIA SETACEÆ (Bristle-like Griffithsia).—Hanging from the shadowy side of a rock or in a mid-tide pool, in tufts from three to six inches long, colour deep crimson, and slightly branched, or rather forked. On immersing it in fresh water, the membrane bursts with a crackling noise, and the colouring is lost: like several others of the genus, it stains paper of a bright carmine, which remains unaltered for years. This seaweed requires mounting as soon as possible, for it soon changes colour, and becomes yellowish. Keep it in *sea water*, dark and cool.

The fructification is a beautiful microscopic object. With quite a low power we see the tuft of little *ramuli* at the end of a branch, within which are tetraspores, cells full of crimson spores, or else we find on naked *ramuli* two larger cells or *favellæ* full of minute red spores. There is a third kind of fructification sometimes found in the tufts which bear the tetraspores, called *antheridia*—minute oval bodies, composed of dense whorls of glossy threads, not perfectly understood. This plant, delicate as it is, may be kept in sea water, for many months preserving its colour and fruit. A glass bottle sealed up will not require changing for a year, and gives an interesting object as a seaside remembrance.

GRIFFITHSIA CORALLINÆ.—We only find this in deep pools, usually on the shady side or under other seaweed near low-water mark. It is jointed like a coralline, but of a rich crimson, and may be known by its strong disagreeable smell, especially when brought home and immersed in fresh water; it then discharges its colour, so must be mounted quickly. The joints in this plant are pear-shaped, and the fruit is clustered round them, protected by very short branches. The tetraspores are densely crowded quite round the joint, the *favellæ* are on one side only, and occupy the place of a suppressed branch. The tufts are usually six or eight inches high. Common on all our coasts.

GRIFFITHSIA EQUISETIFOLIA.—So called, because the stem is thickly set with whorls of *ramuli* or lesser branches, and resemble the *Equisetum* or mare's-tail of our meadows. It is a common plant on the south coast of England and in the Channel Islands, but rare in the north. It is a fine specimen for the album, from three to eight inches long. Colour, red or reddish-brown, staining the paper. Fructification like the *Griffithsia Setaceæ*—with now and then the same curious bodies, supposed to be *antheridia*, secreted in tufts of *ramuli.*

GRIFFITHSIA SIMPLICIFILUM.—Very like the *Griffithsia Equisetifolia,* only more delicate, the branches less forked, the joints longer, and the cells much more transparent, having a wide pellucid border, and narrow line of rich rosy red in the centre. It is rare. Found in deep pools and near low-water mark, Channel Islands, Ireland.

GRIFFITHSIA BARBATA. — If we find this pretty minute species, it is a prize, for it grows only on the coasts of the British Channel and in the Channel Islands. Exceedingly lovely are the delicate fibres, bearing pink tetraspores, and the *favellæ* surrounded thinly by *ramuli*, which protect but do not conceal them. It is most frequently attached to small stones or found on oyster beds. In Jersey it has been found parasitic on larger *Algæ*.

GRIFFITHSIA SECUNDIFLORA.—Very rare: resembles *Griffithsia Setaceæ:* filaments tufted, four to eight inches in height, thicker than hogs' bristles, not sensibly attenuated upwards, but with blunt points, and frequently with short, horizontal, root-like *ramuli* growing from the lower part of the branches. Found in Sark and off the coast near Plymouth.

GRIFFITHSIA DEVONIENSIS. — A small, slender variety, rarely found except on the coast of Devon. Colour, fine rosy red. Dense tufts are met with on muddy sea shores in deep water.

WRANGELIA.

(Named in honour of BARON VON WRANGEL, a Swedish naturalist.)

This is allied to *Griffithsia Equisetifolia*, and has a considerable range, being found in deep shady mid-tide pools, but grows also from perpendicular rocks at low-water mark on all our coasts.

Generic character.—Frond purplish or rosy red, thread-like, jointed, the filaments single tubed.

Fructification.—Tetraspores white, roundish, seated on *ramuli* or lesser branches. *Favellæ* are composed of numerous large pear-shaped spores, arranged in globose tufts, and surrounded by a dense mass of *ramuli.*

The frond is from four to eight inches long: a main stem sends forth long branches throughout its length; which again are repeatedly branched with filaments in whorls. It dries well on paper.

LAURENCIA.

(Name in honour of M. DE LA LAURIENCIA, a French naturalist.)

In these mid-tide pools we find several of the *Laurencia* tribe. They are dark purple or greenish-yellow seaweeds from two to twelve inches high, quite unlike any we have hitherto mentioned. They usually have round hollow stems about as thick as twine, branched, and bearing two kinds of fruit: *ceramidia* or a capsule containing spores; tetraspores irregularly scattered in the substance of the *ramuli.*

LAURENTIA PINNATIFIDA.—A very common species in every pool from extreme high water to beyond the limit of low water, and varying in colour and size accordingly; for we find stunted, blunt-leaved specimens pushing from a dry rock like the black lichen (*Lichina Pygmæa*), and then growing more freely. Of an olive green, but attaining to perfection in a deep tide-pool, anywhere within tide mark, until it branches out in fine purple tufts twelve inches long.

We recognize this by the flattish frond, with main stem undivided, but sending forth stout branches alternately clothed with lesser branches or *ramuli* twice or thrice divided, and often bearing *cup-like* bodies at the tips filled with yellow filaments.

The *Fructification* is of two kinds: *ceramidia* like *Polysiphonia*, but more opaque, and full of pear-shaped spores; tetraspores irregularly dotted in the *ramuli*. This *Laurencia* has often a hot, biting taste, and was formerly eaten in Scotland under the name of pepper dulse. It is found in equal plenty along the coasts of the Atlantic and Pacific Oceans, Tropical Seas, and as far south as Cape Horn.

LAURENCIA CÆSPITOSA (Tufted Laurentia).—A variety of *Laurencia Pinnatifida*, smaller, more delicate, much branched, and variegated in colour from yellowish green to purple.

LAURENCIA DASYPHYLLA (Sedum-leaved Laurentia.)—This is a fine plant for the album, and if gathered in a deep shady pool, as near low-water mark as possible, the specimen will be nearly twelve inches long; the colour varying again from yellowish-purple to pale pink, or even dark purple, and sometimes a mixture of all three, which greatly help the young collector in naming it. Much more slender than the former species, the main stem throws out long lateral branches, all having numerous linear club-shaped *ramuli*, one or two lines in length, and very much attenuated at the base, resembling leaves of a *Sedum* or stonecrop.

The stem under a lens appears to be striated or striped, because this species nearly approaches *Ry-*

tiphlœ, in having a jointed axis, composed of four or five large cells, round a central cavity, and the length of these cells makes the stripes, which are most visible in the youngest branches.

Tetraspores are seen in the club-shaped *ramuli.* *Ceramidia,* ovate capsules, transparent, pink, and containing each a cluster of pear-shaped spores.

This is common on the shores of Great Britain and the Channel Islands.

LAURENCIA TENUISSIMA (Slender Laurentia).—This is a very pretty seaweed carefully handled, as it is tender and somewhat gelatinous. Pale purple or pinkish red, becoming yellowish, and in fronds from six to eight inches long, it is found parasitic on coarser weed in mid-tide pools, but it is by no means common. Seek for it in sunny, shallow pools. It is a straggler from its native shores of the Mediterranean Sea, where it grows in perfection. Here it needs all the warmth our colder climate can give it, and is therefore more "at home" in Guernsey and Jersey, where the hot Gulf Stream from Mexico passes through our channel and influences our tide-pools as well as our land vegetation.

The fruit, often dotted thickly on its branches, small urns containing pear-like spores, or tetraspores embedded in the leaf-like *ramuli.* Weymouth, Isle of Wight, Channel Islands, Torbay, Irish coast, are its localities.

LAURENCIA OBTUSA (Blunted Laurencia).—This is another native of the Mediterranean Sea, but very frequently found in our tide-pools. It is from three to six inches high; the stem as thick as small twine or packthread; of the colour of isinglass; but the outer coats of the branches and their segments have a beautiful pink colour; indeed, when seen in deep water, the whole plant is a rich red. The *ramuli* are short, wedge-shaped, and blunt, with tetraspores thickly sown in them, or bearing *ceramidia;* but these are rare, and instead of them we frequently find those curious cup-shaped bodies full of yellow filaments called *antheridia.* This pretty little specimen grows on *Fucus Serratus*, *Corallina Officinalis*, *Chondrus Crispus* and *Polysiphonia.*

HYPNEA PURPURESCENS.

(Name an alteration of *Hypnum*, the name of a genus of mosses, in allusion to the moss-like appearance of this seaweed.)

This is one of our commonest plants, growing in dense masses on the side of our pools, from six inches to two feet long. The spreading branches, mingling with the more rugged fronds of *Fucus* or *Chondrus Crispus*, is a shelter for the Prawn and the tiny Crab or timid tiny fish. It floats out laden with fruit, berries, or tubercles called *coccidia*, immersed in the *ramuli.*

The colour is dull purple; dries nearly black; does not adhere well to paper.

Generic character.—Frond thread-like, cartilaginous, much branched, cellular. Cut across the stem, it shows large cells in the centre surrounded by a network of smaller ones.

Fructification.—*Coccidia* or berries and tetraspores.

CORALLINEÆ.—CORALLINE TRIBE.

> "Involved in sea-wrack, here you find a race
> Which Science, doubting, knows not where to place."
>
> CRABBE.

In the mid-tide rock-pools the seaweed gatherer is puzzled by the tufted masses of white-jointed foliage which line the rock, or over-grow the old limpet shells. Some are large-jointed, and so unlike seaweeds that formerly they were classed with zoophytes and corals; some are like moss—fine white moss; this is *Jania.* Some corallines mimic the lichens, and spread over the rock in purple and white patches, or run over a seaweed like a scaly parasite; these are *Melobesia* of various kinds. They tint the rocks and stones with beautiful pink, white, and purple colours, and are formed by a deposit of carbonate of lime or vegetable substance. There are three common species on our shores:—*Corallina Officinalis; Jania; Melobesia.*

Generic character.— Thread-like fronds, jointed, branched, mostly pinnate or with smaller branchlets, coated with calcareous or lime deposit.

CORALLINA OFFICINALIS.

(The name from *Corallium*, coral.)

This is the coarsest and largest kind, stunted and often misshapen in the high-tide pools, but growing finer and more beautiful as we advance towards the deep sea. In the water it has a delicate purple tint, but bleaches quickly to a dead white. The fruit is those swollen tips which, when opened, show a cluster of pear-shaped spore-cases, each containing four spores or tetraspores.

If a bit of this coralline be steeped in weak muriatic acid, the structure will be seen of vegetable cells in stripes across the frond, and prove its position in the family of seaweeds. If a bit be dried and held in the flame of a candle, a beautiful white light is produced.

These corallines are abundant on the coast of tropical countries: the shores of Australia have fan-like, rose-coloured varieties, or triply-branched, or whorled, like our *Chara*, but we have none so beautiful.

JANIA.

Generic character.—Has slender branches, forked repeatedly, and intertwisted like a fine white moss. The crust is of carbonate of lime, solid, without pores, and the fruit is like that of *Corallinæ*, but in the axils of the branches, and *not* at the tip.

This is a very pretty weed, and useful in fancy work, various in colour, either white, or pale green, or a pretty pink. Very often cast up in loose masses on the shingle after a storm, or fringing the stems of larger seaweeds.

MELOBESIA.

This will attract attention, although it cannot be gathered. To all appearance it is a scaly, stony substance, growing on rock or seaweed, very like a lichen in form, thin as paper, very brittle, fastened by the middle of each frond, and the edges are free, yet the masses are dense, for the fronds overlie each other, and are spotted with *ceramidia*, or urn-shaped cells, containing each four spores or tetraspores. When a portion of this *Melobesia* is soaked in weak muriatic acid, the coating of lime is removed, and a most delicate zoned structure is revealed by the microscope. A few minutes will remove the deposit of lime. Wash the portions in a watch-glass, and, with a camel-hair pencil, place a morsel on a glass slide, with a drop of water, cover it with a thin piece of glass, and observe how this apparent stone is really a beautiful vegetable structure.

On *Zostera*, *Phyllophora*, and *Chondrus Crispus* we find varieties of *Melobesia* worth examining.

CATANELLA OPUNTIA

(Name meaning a "little chain.")

This may be found even at high-water mark on the woodwork of breakwaters, or in crevices of large boulders. Colour, a very dark purple, almost black when dry, and not adhering well to paper. The creeping fibres at the base of the frond are densely matted, and chain-like cells rise about an inch high.

Fructification.—Two kinds worthy of attention. 1. A berry, usually in the place of an abortive *ramuli* or branchlet, in which is a mass of spores, called *favellæ.* 2. Tetraspores, transversely parted, and surrounded by a clear membrane, forming a distinct cell, and each of these is immersed in an oblong body seated on a main stem.

This curious little plant much resembles the *Cactus Opuntia*, and may be confounded with another seaweed —*Chylocladia Articulata;* but this latter is of brighter colour, grows larger and in denser tufts, the internal structure and fruit quite different.

HALIDRYS.

Generic character.—Frond compressed, branched, bearing oblong *air vessels* on stalks resembling pods.

Fructification.—Oblong, stalked pods, containing both spores and *antheridia.*

This plant ranges from high to low tide. It varies, like all who do so, from short bushy tufts to floating fronds, sometimes *four feet* long. The colour is olive. It is attached to the rock by an expanded disc, so firmly that a man's strong pull will hardly wrench it away, and it is a little world in itself when growing near low-water mark, very productive to the naturalist who learns more than seaweeds.

> "Look who list, thy gazeful eyes to feed
> With sight of that is fair; look on the frame
> Of this wide universe, and therein read
> The endless kinds of creatures, which by name
> Thou canst not count, much less their nature's aim;
> All which are made with wondrous wise respect,
> And all with admirable beauty deckt."

HALIDRYS SILIQUOSA.—So look on this long brown weed, and examine first—itself. Those swollen pods are air chambers, divided into ten or twelve cells, through each of which run several minute tubes or threads; at the end of a branch, other pods, like these, but pierced with small holes, contain the seeds. And yet not simply seeds or spores: divide one, or make a thin slice, and, examining it under the microscope, we shall see seven or eight large cells immersed in the substance of the pod, and in each cell a multitude of oblong, simple, dark brown spores, mingled with tufts of branching filaments tipped with orange-coloured *antheridia:* th ese latterare supposed to fructify the spores.

Then on the frond we find rich silvery tufts of a zoophyte called *Celullaria Reptans*, or fairy plumes of *Plumularia Cristata*, on every branch of which a delicate crystal cup holds the living creature safe from the storm, while it rides upon the floating frond, stretching forth twelve transparent flexible feelers; feeding on invisible golden fish, the *diatom* we call *Navicula*, or swallowing golden rods of another *diatom* called *Baccilaria.* There is another zoophyte who loves the *Halidrys*, *Valkeria Cuscuta:* it resembles in miniature the *Dodder* that lives upon our furze bushes, and is extremely pretty laid out upon paper.

Reader, are all these names hard? and is this life unknown to you? Be not discouraged, neither careless of all these wonderful things: add to this seaweed manual another shilling book,* and the rock-pool and the seaweed will be of double interest.

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* "Common Objects of the Sea Shore."

CHONDRUS.

(Name signifying "cartilage," from the toughness of its frond.)

Generic character.—A flat, cartilaginous frond, divided into branching lesser fronds of purplish or livid red colour.

Fructification.—1. Tubercles, or warts, composed of radiating threads, whose lower joints transform into spores. 2. Tetraspores collected into *sori*, immersed in the substance of the frond.

Chondrus Crispus.—As we pass on to deeper pools, between half-tide and low water, we shall find abundance of this seaweed, better known as *Irish moss*, or *carrageen moss*, sold once as high as 2*s*. 6*d*. per lb., whilst in repute with physicians as a light and easily-digested food for invalids. This plant varies exceedingly in size and colour: in shallow pools, small, pale, and stunted; whilst in the shadow of a great rock, or down at the bottom of a deep pool, how rich is the purple red and reddish-green thick fronds in dense masses, from beneath which the Prawn will dart, the little fish spring forth, the tiny Crab squats squinting for its food, and pretty yellow Nerits and purple *Trochi* slowly climb the fronds! Probably, on the edges of *Chondrus Crispus* the spores of a *Polysiphonia* or of that vagabond *Ceramium Rubrum* have vegetated, and a delicate pencil of rose-coloured filaments may prove a *Callithamnion*. This is rather too coarse a weed for the album: it requires much pressure, and the application of a little isinglass, to make it adhere to paper, but young specimens will be ornamental.

CHONDRUS NORVEGICUS.—A native of Norway. Small and delicate. Often found on the south coast of England.

CLADOSTEPHUS.

(Name meaning a "branch" and a "crown.")

Dark green tufts from three to nine inches high, much branched, unjointed, rigid, whorled with short *ramuli*, spores borne by additional small branches.

This will soon be found in a deep tide-pool. It dries of a darker colour, and will require fixing on the paper. Two species only are on our list—

CLADOSTEPHUS VERTICILLATUS (Whorled Cladostephus), and a shorter, more bushy, spongy kind, called CLADOSTEPHUS SPONGIOSUS, because it really feels like a sponge when taken from the water; and the chief difference between them is in the shorter bristles whorled round the stem, and that this species is of a dirty brown or dirty olive green.

On both these seaweeds we find *Polysiphonia* of several kinds.

CHORDARIA FLAGELLIFORMIS.

(Name from *chorda*, a cord.)

Very quickly are we likely to notice in most half-tide pools a brown, branching, glistening weed, that feels soft and slimy in the fingers, about the size of small twine, and from six to twenty inches long. It adheres well to paper, and may therefore be gathered for the album; but its chief beauty will only be discovered with a microscope. That common slimy thread, if placed between two slips of glass and pressed, will show an axis composed of closely-packed cells, edged with bead-like filaments, amidst which are innumerable spores.

There is only one other species—

Chordaria Divaricata—a native of the Baltic Sea, which we must look for amongst the weed cast up by a storm, and may be known from our British plant by its greater length, paler colour, and dense tufts.

PADINA PAVONIA.

This is an object of much value to collectors. It is a most remarkable plant, so unlike all other seaweed as to be recognized by the simplest description; and therefore, without a difficult scientific sentence, I advise my readers to look at the bottom of some shallow, sandy, sunny pool about half-tide level, and see if there are not groups of fan-like fronds from two to four inches high — curled inwards, striped across, and glistening in orange, green, grey, or reddish hues, sprinkled with white chalky powder. The edge of the frond is fringed with delicate hair-like fibres, and curled inwards.

Fructification.—Very like that of the hart's-tongue fern: the spores are secreted beneath the skin, which breaks longitudinally, and forms an *indusium* or shelter for them.

Many authors have compared this admired seaweed to the expanded tail of the peacock, and probably thence it derives its name; truly, the play of colour on the frond beneath the water is so beautiful, we bend to gaze upon it, and forget to gather it.

Padina Pavonia luxuriates in tropical climates, and grows abundantly on the shores of the Mediterranean Sea, but is found plentifully on the south coast of England, at Torquay, and in the Channel Islands; both Jersey and Guernsey yield very fine specimens.

CHAPTER IV.

Low-Water Mark.

"The gentleness of Heaven is on the sea :
Listen! the mighty Being is awake,
And doth with His eternal motion make
A sound like thunder—everlastingly."
WORDSWORTH

"The water is calm and still below,
For the winds and waves are absent there,
And the sands are bright as the stars that flow
In the motionless fields of upper air;
There with its waving glade of green
The seaweed streams through the silent water,
And the crimson leaf of the dulse is seen
To blush like a banner bathed in slaughter."
PERCIVAL.

WE now pass into the region of low-tide pools, and the beauty of our specimens will increase, though we shall have fewer, and obtain them with more feet-wetting and difficulty.

"The streams of small pleasures fill the lake of happiness," says a thoughtful man. Very small would seem to some the pleasure wrapped up in a tiny spray of seaweed. They can better understand the delight with which the man of business takes a ramble on the sea shore, work-weary, and getting his holiday during the hottest summer months. They can understand the merry shout of exultant children rushing to the beach, with little spades to dig a mimic trench or build their battlements of sand. The pleasure is not small to the invalid who sits under the shadow of the cliff, inhaling the fresh breeze which renews her strength it is not *small* to the active boy away with his shrimping net, springing from rock to rock, eager for the shallows where the pretty Prawns are playing. The boy sweeps them up triumphantly, and *his* little lake of happiness is full.

We are going for seaweeds. The tin can is slung over one shoulder, an oilskin bag is at our girdle for smaller and more precious specimens, a pole in our hand to steady our feet, with a hook at one end to lift the tangled masses of rough weed away.

Beautiful the sea to-day, under the clear blue sky, shimmering and sparkling under the light sea breeze, and the bright little waves reluctantly retreating on the sand, or curling and crisping round the rocks.

We have "done" the upper and mid-tide pools; but they have taught us that better things lie beyond: we have visions of beautiful *Plocamium*, of the rarer *Polysiphonias*, of *Callithamnions*, of *Delesseria*, and of *Dasya*. We go at once to the water's edge, and rightly so. Lift up those heavy masses of brown weed *anywhere*, and most certainly you will find pleasure and employment in the crannies and the sandy ledges beneath them.

Still, let me save from disappointment by forewarning you that seaweeds are as local as land plants; that even as the primrose and the bluebell, the orchis and the heath, have their peculiar territory and preference of soil, so the seaweeds have choice or necessity to love the north side of the rock in the cool shade, or to lie on the open rock in the full heat of the sun.

One end of a bay will give abundance of *Griffithsia;* the other end no *Griffithsia*, but plenty of *Polysiphonia.* It will be a matter of experience.

The rock-pools now so deep and clear have most of the seaweeds from the upper pools in larger growth; the *Corallinæ* is dense, and beautifully tinted with its own delicate blush of red, and the parasitic rosy *Callithamnion.* There are long coils of the *Chorda Filum*, probably with bunches of *Ceramium*, thick forests of *Cystoseira* and *Halidrys*, laden with delicate fronds of rarer seaweed. Look calmly down, and pick the *small* feathery tufts for examination at home.

As we now find a variety of *Polysiphonias*, it will be as well to give the *generic character* of the tribe.

POLYSIPHONIA.

(Name from the Greek, signifying "many siphons," or tubes, alluding to the number in the stem.)

Generic character.—Frond thread-like, partially or generally jointed, joints longitudinally striped, composed internally of parallel tubes ranged round a central cavity.

Fructification.—Double or distinct plants. 1. *Ceramidia*, or urn-shaped cells containing pear-shaped spores. 2. Tetraspores, or group of four spores, imbedded in swollen branchlets.

Polysiphonia Byssoides. — At low-water mark and in four or five fathom water, seek this beautiful species: it will be seen floating out from stones or shells, probably under masses of shadowy *Laminaria*. It is one of the handsomest of all the *Polysiphonias;* both in the book, where it becomes a dark red-brown, or fresh in the water a crimson lake, spreading from a central stem, branching out alternately, and feathery with its delicate fibres. Under the microscope we see the crimson tubes, seven of them if we make a transverse section, else we see but four: these, seated on the branches and amid the feathery fibres, are pearly white urns, with about five or seven red spore-cases. If we have a branch with tetraspores, then equally lovely is the group of seeds in transparent cells on a stem fringed with little pink fibres. Length, from four to ten inches.

POLYSIPHONIA ELONGELLA.—This is another beautiful and more rare plant, found at lowest tide, and only in its beauty during spring and summer. It is from two to five inches long, intensely red, much branched; and if examined with a microscope, the *four* siphons are concealed by large hexagonal cells, well marked on the surface by transparent lines. The capsules or urns are very large and reticulated or like net, enclosing crimson spores. Few plants are more variable than this. It is rich and of a delicate rose red in early summer time, but he who seeks it in September would find but a few ragged stems, spiny and bare.

Although rare, this plant is found at Sidmouth, Dublin, Jersey, Guernsey, and Sark, on the coast of France, and in the Adriatic Sea.

POLYSIPHONIA VARIEGATA. — On mud-covered rocks and on *Zostera*, of purple hue, and from four to eight inches long, in dense tufts passing from a stout stem to filaments of extreme fineness. Three broad parallel veins mark the stem; but on making a transverse section, we find six siphons. The fruit is broad oval capsules and small tetraspores imbedded obscurely in slightly swollen *ramiui*, more or less dark purple.

This is very local, abundant near Plymouth, and is one of the proofs why a seaweed collector should by no means despise mud-banks, for here also will be the finest *Callithamnions*, such as *Callithamnion Borreri* and *Plumula.*

POLYSIPHONIA PARASITICA.—This is so different from the others, that it must be obtained if possible. Look for it on the *Melobesia* at low tide. It has fronds more like a tiny fern, when spread out fan-like on the paper. Colour, a fine clear red. To find this pretty specimen, go to the extremest edge of the water, and on the sides of the rock, on clumps of the coralline called *Melobesia,* we find small tufts of one or two inches high, well worth bringing home. The stem is like *Polysiphonia Elongella,* marked by hexagonal cells concealing eight siphons. This plant in structure closely resembles another, *Rytiphlœa Complanata,* and may be compared with it. (See " Mid-tide Pools.")

POLYSIPHONIA ATRO-RUBESCENS.—This grows in dense tufts of brown-red in lowest-tide pools. Though, from its somewhat straggling and black appearance, we might not value it much, yet the structure is surprisingly beautiful under the microscope ; the twelve siphons being twisted spirally up the joints, and under water it is of a delicate crimson lake colour. The fruit is abundant, and the plant common on our coasts.

Polysiphonia Subulifera.—Very local, but to be found on the rocks in deep water at Weymouth, and sometimes in the Channel Islands, higher up, parasitic on seaweed *Rytiphlœa* and *Polyides*.

Polysiphonia Furcellata. —This is very rarely found actually growing, but comes up in dredging, or is thrown ashore after a storm.

Polysiphonia Brodiœi.—A large, somewhat coarse species, of brown colour, which speedily decomposes and emits a disagreeable smell in fresh water. The opaque stem, *concealing* its seven siphons, which can only be discovered by a transverse section, and the pencil-like tufts of delicate fibres are the chiefs marks by which to distinguish it. We find it commonly on the coasts round England, Scotland, and in the Channel Islands.

Polysiphonia Affinis and Polysiphonia Subulifera are also found in lowest-tide pools, but are not remarkable for beauty, and do not belong to the common objects for a seaweed book.

CALLITHAMNION.

(Name signifying " a beautiful shrub or plant.")

This family contains the smallest yet loveliest of the seaweeds: some of them attain to a length of eight inches, and in appearance so much resemble *Polysiphonia* as to require the aid of a pocket lens or microscope to discern the difference; some are so minute as to appear but as a fairy fringe on the edge of sea-grass *Zostera*, or a velvety substance on mud-covered rocks, or a pencil of rose-coloured filaments on *Ceramium Rubrum*, or a mere blotch on the old sea-beaten stems of *Laminaria Digitata*.

On paper they form the prettiest little trees laden with fruit, and under the microscope the structure and colour are perfectly beautiful. They are not difficult to recognize if we attend to the following directions:—The tufts are usually fine, small, silky and soft to the touch: floating out in the water, the slender, rosy, and often much-branched filaments with dots along the branches will arrest attention; and these are the

Generie character.—Frond rosy or brownish-red, thread-like, with an opaque and cellular or translucent and jointed stem. Each joint has a single long cell of colour, and the intermediate space is white and transparent.

The fruit, quite different from that of *Polysiphonia*, consists of a number of berries inclosed in an envelope, called *favellæ*, and tetraspores are scattered along the branchlets, giving the dotted appearance I referred to above.

There are twenty-five species of this plant, and most of them are common on the shores of Great Britain and the Channel Islands.

CALLITHAMNION TETRAGONUM (Square-branched Callithamnion).—This is one most likely to mislead a beginner because of its robust habit and size, also because the stem is more opaque and the joints less visible than in any other species: this is owing to numerous red veins which meander up the stem, partially concealing the coloured cell which forms the joint. It is a beautiful specimen, often found on the frond of *Chondrus Crispus*, *Codium Tomentosum*, or on *Laminaria* also.

The colour is darkish red, but rapidly becomes a brilliant orange in fresh water, and gives out a rose-coloured powder; in drying it loses somewhat of its elegance from the pressing together of the delicate tufts of *ramuli*, which expand under water, and give it the feathery appearance that is so beautiful. We scarcely see the tetraspores, they are so minute, but the *favellæ* are quite visible when present, generally two berries seated in a tuft of three short *ramuli*. This species is common on all our coasts.

CALLITHAMNION PLUMULA (Feathery Callithamnion.)—Of all the seaweeds we have yet examined, not one is so lovely under the microscope, or makes a prettier small specimen on paper. It is from two inches to four inches high, grows on the rocks or on other seaweed. The soft red filaments spread out in the water will attract the collector; but he will never know the prize he has got until, floating it on paper, the carmine hue and the rare beauty of the plant in fruit makes him examine it more closely with a lens or microscope. Then the regularity of the branches, unlike every other species, decides it at once: right and left on every joint a comb-like branchlet springs, laden probably with tetraspores, or on shorter main branches a group of *favellæ*.

This charming plant is scattered in its loveliness everywhere. Dr. Hooker gathered it off stormy Cape Horn. Mr. Gunn sent it home from the sunny bays of Van Diemen's Land. So gracefully yielding to the rough waves' play, that even those delicate tetraspores are not shaken from their sprays until the time when they must die to live.

CALLITHAMNION CRUCIATUM (Cross-bearing Callithamnion).—On mud-covered rocks at lowest tide; rather rare. This may be known from *Callithamnion Plumula* by the tips of the branches being evidently tufted, opposite branchlets at every joint of the larger *ramuli*, and crimson tetraspores, marked distinctly with *a white cross.*

The filaments are from one to two inches long, hair-like, flaccid; colour, brownish-red. It adheres closely to paper, but is apt to decompose if wetted after once it has dried.

CALLITHAMNION BRODIÆI.—Parasitic on other sea-weed in deep pools. At first sight may be mistaken for a small specimen of *Callithamnion Tetragonum;* but examined with a lens the lateral tufts are quite differently arranged. The tetraspores are numerous, the *favellæ* large, and by crushing one we see how full these berries are of angular spores.

This is rather a rare plant, but found at Torquay, Cornwall, and Guernsey.

CALLITHAMNION HOOKERI.—This was discovered by Dr. Hooker, and is now found dispersed along the British shores from Orkney to Cornwall, and in Ireland, also in the Channel Islands.

It grows on coarser seaweed and on sandy rocks. A variable species, yet not difficult to understand if we keep a few leading features in view, such as—An opaque stem and branches, short joints, very distinct branches which have *ramuli* right and left, which *ramuli* are again branched or pinnated at every joint; tetraspores seated on the *pinnæ*. Colour varies from full purple to brownish-red, sometimes pale pink, and fading rapidly in fresh water to dirty white; therefore keep it in sea water, or put salt in the water you use to cleanse it before mounting. It is not often more than three inches high.

CALLITHAMNION ARBUSCULA (Bushy Callithamnion).—Look for this on rocks or mussel shells left bare by the tide at lowest ebb. It is of deep brownish-red colour, much tufted, matted, the stem stout and full of red veins, branched alternately, and their *ramuli* branched again, and set with tetraspores. The lesser branches are often decidedly forked, and the *favellæ* are clustered in three berries on the *ramuli*. When dry this often has a greenish hue, and looks well on paper with careful arrangement and thinning out of the branches. Common on the south coast and Channel Islands.

CALLITHAMNION GRACILLIMUM ("Fern-leaved" Callithamnion).—So named by one of the most intelligent observers and collectors of seaweed, Mrs. Griffiths, who found magnificent specimens growing along the mud-covered base of the harbour pier at Torquay. It was first gathered on the shores of France by Mons. Graleloup, who sent specimens to the elder Agardh, by whom it was published in the year 1828.

The expression "fern-leaved" well describes this most graceful of the beautiful tribe to which it belongs; the finely-pinnated branches are indeed like fairy ferns. There is a peculiarity in its fruit-bearing: the tetraspores are usually sessile, or seated along the small branchlets in rows; here they are single and at the tips of the *pinnæ* or lesser branches. The *favellæ*, usually at the tips, are here at the base of the *ramuli*, and very distinct.

We find this on the face of perpendicular rocks at low water, *under* the heavy masses of *Fucus*.

CALLITHAMNION THUYOIDEUM.—Much smaller but somewhat like *Callithamnion Gracillimum* in the elegance of its fronds: the plant is altogether more robust and regular, a main stem branching alternately right and left, scarcely two inches high, and not easily distinguished without minute examination. The *favellæ* burst irregularly from the stem instead of the usual bi-lobed berries. The plant is rare. Has been found at Torquay, Yarmouth, Falmouth, Ilfracombe, and Jersey.

CALLITHAMNION BYSSOIDEUM.—This is found most frequently on *Codium Tomentosum*, in tufts from two to four inches long. The collector will do well if he remembers that on our coarser weeds not fit for the album we find our greatest treasures. The filaments of this *Callithamnion* are fine as cobwebs, often laden with fruit, and it is a beautiful object when mounted for the microscope as I have directed in the chapter on mounting seaweeds. The stem consists of simple joints, without veins. The *favellæ* are large double berries, transparent, full of spores. The tetraspores large and not crowded on the pinnules, rarely more than two on each, which enables us to see them better. The tips of the branches are tufted with colourless, exceedingly fine filaments. Quite a native of Britain; not noticed elsewhere.

CALLITHAMNION POLYSPERMUM.—A very common species. It grows upon other plants: *Fucus Vesiculosus* and *Fucus Serratus*. Sometimes quite chokes a young frond with matted fibres of brownish red or pale purple. It is not large: the tufts are but from one to three inches in diameter; but they are so prolific that the little forest soon overruns its ground. It is worth examining, for the transparent stem shows well the narrow cell of rosy hue within, and on the branches sit close rows of tetraspores or a heavy cluster of berries (*favellæ*), or a third kind of fructification—those little-known *antheridia*—a kind of vivaparous tetraspore, says Harvey. Any way, these mysterious dots are in a chapter of God's works not yet spelt out.

CALLITHAMNION SPONGIOSUM. — Dark-coloured, closely matted, and not very interesting. Found abundantly on the coast of England and in the Channel Islands.

CALLITHAMNION TETRICUM.—This is one of the largest and coarsest species. Colour, a very dark, dull brownish-red. It grows abundantly on the face of perpendicular rocks facing the sea at low-water mark, or even half-tide level in deep pools. The tetraspores are minute, sessile, and on very short *pinnæ;* the *favellæ* are double on irregular branches. This grows in dense tufts from four to eight inches long, all round the south coast of England, the west of Ireland, and in the Channel Islands.

CALLITHAMNION ROSEUM.—A beautiful small species, growing on other seaweed, frequently in estuaries or muddy places, which *Callithamnions* prefer. *Favellæ* at the ends of the branches, and often in considerable groups; tetraspores, one on each joint of the lower end of the branches.

CALLITHAMNION CORYMBOSUM.—Though small, this plant may be readily recognized, on floating it out, by the level top of its branches. The colour is rosy-red; it is very slender and hair-like, soft, and adhering closely to paper. Not uncommon on other seaweed at low water.

CALLITHAMNION FLORIDULUM.—A young marine botanist would hardly guess at this plant, but pass it by a thousand times, it is so plentiful and so insignificant and utterly graceless on paper. On all rocks from half-level downwards where *sand* or *mud* abides. There probably we notice a reddish fringe, a kind of down, upon the rock left dry by the tide, or like little red cushions under the overhanging brown weed. This is a *Callithamnion*. Its fruit was first discovered by Mr. Ralfs on specimens found at the Land's End. On the coast of Ireland it is torn from rocks by the rough sea and cast ashore, where they are called *figs*, and collected as manure.

Fructification.—Tetraspores oval on short stalks on the silky filaments, which are not branched, or rarely so, but forked.

CALLITHAMNION ROTHII — is found in precisely the same situation, and can only be recognized by the fruit, which consists of tetraspores three together at the tips of the branches, and not singly up the filaments, as in *Callithamnion Floridulum*.

CALLITHAMNION MESOCARPUM.—Another of these small plants, forming a broad, shaggy, purple crust on rocks at extreme low-water mark. Filaments minute, tetraspores crowded about the *middle* of the filaments on forked stems.

I HAVE now described sixteen of the prettiest and commonest *Callithamnions*. Though placed in the division of low-water mark, they range to the half-tide level: they will be found in their greatest perfection when thrown up from the deep sea after a storm. The collector having once well learnt the structure of the plant and its form of fructification, will easily recognize rarer species, and use more scientific books than this. We must now mention a common but very pretty seaweed for the album.

DELESSERIA TRIBE.

(Named in honour of Mons. DELESSERT, a French naturalist and botanist.)

This is a strikingly beautiful tribe; contains three kinds of red seaweed that all collectors seek with avidity, and return home with some disgust if they find neither *Delesseria*, *Nitophyllum*, nor *Plocamium* in the bag or tin can.

Frond rose-red, flat, membranaceous, with a mid-rib.

Fructification.—Two kinds on distinct individuals. 1. Hemispherical tubercles (called *coccidia*), mostly on the mid-rib, containing a tuft of filaments bearing spores. 2. Tetraspores forming definite spots in the frond, or in distinct leaf-like processes.

DELESSERIA SANGUINEA (Red Dock-leaved Delesseria).—This is a great prize. Look under the masses of *Fucus* at extreme low-water mark: you must not fear wetting your feet, if you want either this or good *Plocamium*: wade into the sea, and seek them in the shadow of a rock under water; there you will probably find these beautiful blood-red leaves, veined like a chestnut leaf, and varying in size from three to ten inches. In summer the leaves are large with a waved margin, smaller leaves springing from the mid-rib as the season advances. In the winter these leaves decay, become ragged, and the bare stem is found with the fructification either tubercles on little stalks or tetraspores produced in little leaf-like bodies. A variety is sometimes found with lobed leaves; the mid-rib divides near the top, and the leaf consequently forks.

The substance of this plant is delicate; it adheres closely to paper, and preserves its colour admirably.

DELESSERIA SINUOSA.—I will not separate this from its brother *Delesseria*, though you will rarely find it, except after a storm, thrown up on the shore, on the stems of *Laminaria Digitata.* It flourishes at ten fathoms deep, and the jagged claret-red leaves do not adhere so well to paper nor give so pretty a page. The tetraspores here are imbedded in minute slender processes fringing the margin.

DELESSERIA ALATA (Winged Delesseria).—This is beautiful, and in some places most abundant. The stem is forked, branched, and little fronds like leaves run up the stem and spread out thickly at the top; the colour a rich dark red. All the winter it is in a ragged, sapless state, and will not adhere to the paper; but early in March the growth of young fronds begins, and fruit is found of both kinds. When the granules abound in the leafy processes, the colour is deepened, and the whole plant is one of great beauty.

It frequently comes up in dense tufts on the stems of *Laminaria Digitata.* It is abundant at Shanklin, in the Isle of Wight, on the north coast of Guernsey, on rocks and larger seaweed between tide marks, and in four to ten fathoms water all round the British coast.

DELESSERIA HYPOGLOSSUM (Proliferous Delesseria).—The chief characteristic of this pretty species is the repeated proliferous leaflets from the mid-rib. It is very variable. Tufted four to six inches high; sometimes the first leaf is very narrow, larger ones growing from and upon it. Tubercles round and immersed in the mid-rib about the centre of the leaflet; tetraspores in linear lines or spots on each side of the mid-rib. Colour, a pinky red, soon fading in fresh water. Grows on rocks and larger seaweed.

DELESSERIA RUSCIFOLIA and DELESSERIA AUGUSTISSIMA are variations of the two former, smaller, and scarcely worth the rank of separate species. We pass on to seek another branch of the family, whose first characteristic is having leaves without mid-rib or veins

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NITOPHYLLUM.

(Name meaning "shining leaf.")

Generic character.—Frond plane, delicately membranaceous, rose-coloured, without veins, but cellular-like net-work.

Fructification.—Capsules or cells containing spores imbedded in the substance of the frond, and granules forming distinct scattered spots.

NYTOPHYLLUM PUNCTATUM.—This is found only in deep pools at lowest ebb of the tide, but far more frequently gathered amidst the cast-up weed on the shore after a storm.

Most delicately beautiful is this broad pink frond dotted all over with spores. The size of this plant is sometimes enormous. Mr. Moore, at Cushenall Bay, in the west of Ireland, found specimens five feet long by three feet wide, but our usual fronds rarely exceed five or six inches long by four broad: even this makes a splendid page, especially if well laid out on *good* drawing paper. Then, indeed, it is, as its name imports, *a shining leaf* of exquisite rose pink: dark hued capsules and *sori* add to its beauty, and the edge is often curiously plaited or goffred, requiring great care in the fixing. In fresh water it crackles and fizzes like *Griffithsia Setacea.* It seems to be common on the Irish coast, and at Cornwall, Plymouth, and Channel Islands. I have splendid specimens from Alderney.

NITOPHYLLUM HILLIÆ.—A variety first found by the late Miss Hill at Plymouth. It is faintly veined at the base, rising from a short stem, usually of a broad fan-shaped figure slightly cleft or lobed. The veining sometimes extends nearly over the frond, and the substance is thickish but very tender, like "soft kid leather," says Mrs. Griffiths. It may also be noticed by its peculiar and disagreeable smell. The colour is a fine deep crimson.

NITOPHYLLUM LACERATUM.—A famous specimen, trailing up a page six to ten inches long: the ribbon-like fronds of dark red, edged with little leaflets, or rather torn edges, which are dotted with spores and look darker than the frond, so giving it a bead-like border. This plant is valuable to the botanist. It has a curious habit of growing so close to the rocks, and adhering by little roots from the under side of the frond, that it is difficult to get it off uninjured; but it also comes to us on the stems of *Laminaria,* and in a tangle with other weeds after a storm.

NITOPHYLLUM BONNEMAISONIA. — A very pretty delicate variety, fan-like, with scattered groups of tetraspores, and faint veins from the root distinguish this plant. The habit of the frond differs much in various individuals, some being broad and scarcely cloven, others deeply cleft into ribbon-like segments.

It is a deep-sea species, parasitic on *Laminaria*, and found in the Channel Islands, on the Irish coast, and at Torquay and Ilfracombe.

NITOPHYLLUM GMELINI and NITOPHYLLUM VERSICOLOR are varieties not common, and thrown up by a storm from June to August.

PLOCAMIUM.

(Name meaning "intertwining hair," in allusion to the finely-branched fronds.)

This is the desire of all hearts in collecting for fancy work, or album, or microscope: a treasure for every one. We hear a scream of delight from the little lady in a rock-pool, "*Plocamium!*" We make a rush for that mass of crimson weed rolled in by a great wave—"*Plocamium!*" We greedily clutch the floating rosy fronds as we push aside the heavy *Fucus* in a deep rock-pool—"*Plocamium!*" And then, when the album is overlooked, how we gaze down the page that is filled with the graceful, rich, bright red *Plocamium*, remembering the sunny shore where it was gathered!

> "Crimson weeds which spreading flow,
> Or lie like pictures on the sand below,
> With all these bright red pebbles that the sun
> Through the small waves so softly shines upon."

Look at it closely with a pocket lens: you will see on some plants the red berry called *favellæ*, on others a kind of fructification we have not yet described—little trefoils, deeply crimson, scattered thickly amidst the comb-like branchlets.

You will not surely be content with this superficial examination. Take a little spray of *Plocamium* with these trefoils, called *stichidia*, put it under the microscope with the necessary thin cover and drop of water, and you will see a beautiful structure as of fine net over rose-coloured substance, and in each division of the trefoil numerous tetraspores imbedded. The sight will repay all trouble, and again and again you will look, and call others to see.

This lovely *Plocamium* is abundant everywhere, on the stormy coast of Cape Horn, on the sunny shores of New Zealand, under the tropical sky of Brazil, and equally healthy and happy on the rocks of the cold Baltic Sea, and in the soft sea of the Channel Islands, where, in truth, it partakes of the softness, our island specimens being very bright and flexible, whereas up in the north they are both ragged and rigid.

I give no scientific description beyond this:

The stem is red and flat, branched; the branches toothed as it were *on one side*, with three or four *ramuli* always on the same side: there will be a kind of *intuition* the moment you see it—"Oh, *that* is *Plocamium!*"

BONNEMAISONIA.

(ASPARAGUS-LIKE BONNEMAISONIA.)

BONNEMAISONIA ASPARAGOIDES.—A most delicate pretty plant, so unlike any other that we can scarcely mistake it. Seen floating in the water, nothing can be more feathery and elegant, nor does any dried specimen ever come up to the living growing in a shadowy pool.

The fructification is so distinct as to be clearly discerned by the unassisted eye—like fruit upon a tree. The frond is narrow, flat, rose pink, and *ciliated*—remarkably so, and transparent urn-shaped capsules are seated between the *cilia*. The spores are pear-shaped, crimson, with pellucid border. It is more common in the north of England and Scotland than in the south, yet we have some good places for it in the Channel Islands.

FURCELLARIA FASTIGIATA.

We must have some specimens of seaweed not quite so beautiful as the rose-red varieties already noticed, because I hope that some of my readers will go beyond the surface, and examine fructification and structure. This and the following *Polyides* will give selections of fruit and stem truly interesting.

This is a common plant even on mid-tide rocks, often covered with patches of *Callithamnia* and zoophytes.

Rigid and brownish-red; the stem branches from a *creeping root*—a notable distinction.

The fronds are densely tufted, from four to eight inches in height; the tips are all even, and swollen into lanceolate pods. These pods are the supposed fructification, but Harvey seems not certain of the reality of the so-called spores. Make a thin transverse section, and place it under the microscope with thin glass cover and drop of water. You will see an outer row of closely-packed cells, then a row of oblong dark red spores, then some loose bead-like cells, and in the centre a kind of pith; bear all this in mind if you want to decide between *Furcellaria* and a neighbouring plant in the same pod extremely like it.

POLYIDES ROTUNDUS.

This has a frond also brownish-red, cylindrical, solid, forked, and densely tufted; but observe, the root is a *disc*, not creeping: the fructification is evident as large *warts* upon the frond, and if we make a section and examine a thin slice, we shall see regular groups of spores in large cells amidst closely-packed filaments of clear bead-like cells, tipped with larger cells of deeper colour.

Tetraspores are also found on separate plants immersed in the frond.

Both *Furcellaria* and *Polyides* are found on rocks and in tide-pools, frequently on the coast of England, Ireland, and in the Channel Islands.

GRATELOUPIA FILICINA.

(SLENDER GRATELOUPIA.)

A dark purple weed, not very much admired, with small linear fronds, scarcely exceeding two inches, and rare.

It may more likely be found in bays where a small streamlet runs into the sea.

At Sidmouth, Exmouth, Ilfracombe, and Cornwall, rather plentiful.

IRIDEA EDULIS.

This must long ago have attracted our attention. A flat oval upright frond of dark red, often glittering in the water with bluish and purplish tints, and still more often ragged and eaten into holes by marine animals, who luxuriate on its fronds. It is also eaten by the fishermen in the south-west of England, who pinch it with hot irons to make it taste like oysters. In Scotland they roast it in the frying-pan; but seldom will you find it in its own pool without a pretty little Sea-slug, or yellow Nerit, or purple *Trochus*, enjoying the pasture God has made for them.

HIMANTHALIA LOREA.

(From the Greek words meaning "strap" and "branched.")

The frond properly so called in this plant is an olive green cup or top, from the centre of which springs several long, branched, strap-shaped filaments, from a quarter to half an inch wide, and from two to ten, or even twenty, feet long. These straps are dotted with pores, which are apertures by which the spores escape, for at each dot there is a large cell or conceptacle filled with transparent jointed threads, amidst which are three or four olive-coloured spores.

The substance of these strap-shaped filaments is a watery gelatine transversed by confervoid threads. If cast ashore, we find this covered with yellow dots, and the *mucus* of the plant cast forth with the spores as in a death struggle, as the battle of wind and waves have torn it from the rocks below.

Himanthalia is common everywhere. Children call it "sea-thongs."

CHORDA FILUM.

(Name signifying "a cord.")

Generic character.—Frond simple, cylindrical, tubular; the cavity is divided by partitions into separate chambers. We must cut it longitudinally to see this, and make a transverse section to see why it is so slippery. In doing so we perceive that the substance of the cord consists of large cells, whilst the outer membrane is clothed with pellucid hairs of gelatinous, bead-like filaments. The cord itself is wonderfully long, sometimes from twenty to forty feet, and spreads out like a meadow of waving grass under water.

Storms tear it up and cast it ashore, but, though worthless for our album, it often bears a rich harvest of zoophytes. I remember well how beautiful it was in Bembridge Harbour, fringed with the feathery *Plumularia.* Rocking in a little boat, and looking down into the calm, sunny water, I could see millions of living creatures moored by the stalwart cord and rising or falling with the tide, which brought them in food enough and to spare, of delicate *diatoms* from the deep ocean beyond.

CHORDA LOMENTARIA is simply a variety of *Chorda Filum;* but do not throw it away, especially if it has tufts of fine yellowish hair growing upon it. These tufts are a curious microscopic plant called

MYRIOTRICHIA.

(A name signifying "a thousand hairs.")

There are two species often on the same cord—*Myriotrichia Filiformis* and *Myriotrichia Clavæformis.*

They are transparent delicate filaments, beset at irregular intervals by short papiliform *ramuli*, among which we find spherical spore-cases full of dark spores.

ODONTHALIA DENTATA.

(Name from two Greek words, signifying "tooth" and "germ, or branch.")

I have never found this myself, because it is peculiarly a northern seaweed. Those who explore the tide-pools of Scotland, north of Ireland, and coasts of Durham and Northumberland, may find it abundantly, and it is well worth collecting.

Generic character.—A flat frond, toothed at the edge, dark red or purple, faintly ribbed; from three to twelve inches long.

Fructification.—Twofold on distinct plants. 1. *Ceramidia* more open at the pore than those of the *Polysiphonia*, vase-like, containing a cluster of pear-shaped spores. 2. *Stichidia* in long pods, containing a double row of tetraspores.

The fruit is found on the margin of the frond, or in the axils of the teeth, on delicate pellucid stalks.

NACCARIA WIGGHII.

(Named after NACCARI, an Italian botanist.)

A most charming plant, and very rare; but Miss Theodora Clarke found it at Shanklin, Isle of Wight. In Jersey Miss White and Miss Turner find it, and in Guernsey it is also found at extreme low tide.

Generic character.—Frond flat, rosy red, from six to twelve inches high, with irregular branches beset with minute *ramuli*, which become swollen with fruit, and then resemble pods of rich crimson hue, filled with spores.

When examined under a microscope, the structure of this plant is beautiful: the centre of the stem is occupied by large transparent cells, over which is spread a covering of minute cells, and the frond has the appearance of rose-coloured net-work.

GLOIOSIPHONIA CAPILLARIS.

(Name from two Greek words signifying "viscid" and "tube.")

At extreme low-water mark, but more frequently thrown up after a storm, we find this beautiful plant; the colour is a fine rosy crimson, and valuable for our album. We shall know it by the

Generic character.—Frond tubular, from three to twelve inches long, filled with watery gelatine: several fronds arise from the same base, all of them undivided, but much branched with extremely fine lesser branches.

This plant is one of those which require a microscope to enable us fully to appreciate its beauty; for the clear, transparent texture then shows delicate filaments radiating from the centre, with crimson spores imbedded in them. The walls of the frond are composed of closely interwoven longitudinal fibres, through whose joints run a narrow coloured bag, all of which is lost in the dried specimen, as, from the gelatinous nature of the plant, it adheres very closely to the paper.

This is found all the summer, on the coasts of Devonshire, Cornwall, Sheerness, Falmouth, Ireland, Scarborough, and the Channel Islands.

SPYRIDIA FILAMENTOSA.

(Name from a Greek word signifying "a basket.")

This is a very local plant, more abundant in the Channel Islands and along the French coast than in

Great Britain. Said to be plentiful on the coast of Anglesea.

Generic character.—A thread-like plant, dull red, and often faded; the frond is tubular, and divided into joints by transverse bands, placed at short intervals, giving the stem a striped appearance; the main stem is once or twice forked, densely clothed with lesser branches, and from two to ten inches high.

Fructification.—Two kinds on distinct individuals, 1. External tetraspores, which are lovely little groups of red spores in a transparent berry seated on the *ramuli.* 2. Groups of stalked receptacles in the midst of short *ramuli* called *favellæ,* transparent net-work containing crimson spores.

This has been found at Torquay, Jersey, Southampton, also in Guernsey, by Mrs. William Collings.

NEMALEON MULTIFIDUM.

(Name from two Greek words signifying "a thread" and "a crop of threads.")

This is not very desirable for the collector, but is frequent in pools at extreme low-water mark.

Generic character.—Frond cylindrical, elastic, solid, of a dull purple, from three to ten inches long, generally forked near the base, and repeatedly forked upward towards the tips. It feels slimy, and is very gelatinous. Whenever this is the case, take some of the slimy plant home, and be sure the microscope will reveal beauty instead of anything disgusting.

Slimy fronds have usually a covering of delicate filaments composed of minute cells, strung together like glass beads, and here and there, more or less abundantly, spores will be found seated amidst them. A transverse section of any such plant is a beautiful object.

Nemaleon loves the rough sea, and grows in exposed situations along the western coast of Ireland and Scotland, also at Torquay, Falmouth, and Channel Islands.

PORPHYRA.

(From a Greek word signifying "purple.")

Generic character.—Delicately membranaceous, flat, purple.

This should have been mentioned with *Ulva* in the first-tide pool, and yet, as it is found everywhere within tide marks, and has its proper scientific place in the *Synopsis,* we briefly notice it here.

Porphyra is also called *Laver* and *Sloke.* It is a favourite dish with some people, stewed for several hours, until quite tender, and eaten with pepper, vinegar, and butter; others prefer it cooked with leeks and onions, or pickled and eaten with oil and lemon juice. It does not look inviting, and the taste is peculiar, but is very wholesome, and will keep a long time in closed tin vessels; therefore valuable in long sea voyages.

As a specimen for the album, *Porphyra* requires careful treatment, or else it shrinks, crumples up, and starts from the paper; whereas, if well laid out, it is beautiful, especially *Porphyra Laciniata.* This is the best way of mounting it: Float the purple frond on the paper, raise it gently, cover it with muslin in the common way, but do not remove the muslin for two or three days; meantime change the blotting paper (which of course is laid over the muslin) very frequently, and dry the paper at the fire, laying it on quite warm; this so thoroughly dries the specimen that it adheres perfectly to the paper.

Porphyra varies in size and colour between the tide marks—sometimes long and ribbon-like, violet or purple; sometimes long, broad, and changes to reddish purple and yellow.

GIGARTINA.

(Name from the Greek word for a "grape stone," which the tubercles resemble.)

Generic character.—Frond cartilaginous, thread-like or flat, irregularly divided; purplish red.

Fructification.—Of two kinds—external *tubercles* containing spores, and tetraspores.

GIGARTINA MAMILLOSA.—This is the commonest of four species found in our British tide-pools. It is so like some varieties of *Chondrus Crispus* that we should fail to recognize it without close attention. Observe the channelled frond, rough with *papillæ*, the often broad forked tips. Cut a section of the frond, and its *periphery*, or outside skin, is not simple cellular membrane, but composed of delicate filaments, laxly set in pellucid jelly. It does not adhere well to paper, or particularly please us in the album. Colour varies from purplish-red to olive green or yellow.

Common on all rocky shores.

GIGARTINA PISTILLATA.—A remarkable and rare plant, found by Dr. John Macculloch, Dr. Jacob, and Miss Turner, in the Channel Islands. Also on the coast of Devonshire.

Now this is really a prize for those who are making anything like a scientific collection. It is generally so laden with fruit as to arrest attention at once. *Tubercles* seated on a small branch or *ramuli*, which projects like a horn from beneath the berry. The fronds are densely tufted, two to six inches high, rising with undivided stem about three inches, then spreading out fan-shaped, and forked repeatedly. Colour is dull purplish or brownish red. Look for it in winter on rocks at lowest-tide mark.

GIGARTINA ACICULARIS.—This also is rare, of a smaller size and more delicate structure, with fewer *tubercles*, and the colour becomes pink in fresh water.

GIGARTINA TEEDII.—Very rare, perennial, and only found in deep water.

CHAPTER V.

The Lowest-tide Pool.

CERAMIUM.

(For generic character of *Ceramium,* see page 46.)

Ceramium Gracillimum. — A beautiful little plant, softer and more gelatinous than any other British *Ceramium.* The common kinds are described in the Half-tide Pool.

This species is so small and slender that it can scarcely be laid out properly on paper, the excessively fine pinky threads tangle so hopelessly. The fruit and texture of the plant is lovely under the microscope, and we find it often at extreme low-water mark on mussel shells and coralline. It is most abundant on the south coast of England and in the Channel Islands.

Ceramium Nodosum.—On sandy shores, often at the roots of *Zostera.* The thread-like, white, transparent fronds are knobbed at the joints with a band of brownish-red minute cells. The fruit is a berry at the end of a branch, or rows of tetraspores, one on each joint of a *ramulus.* The tips of the branches are decidedly forked, and the whole plant free from spines.

Ceramium Strictum.—This will be distinguished by its purple colour, by the tetraspores circling the branches, and by the tips of the forked branches being frequently clothed with long soft hairs, which Harvey thinks of importance, and requiring further observation, as resembling those hairs in *Polysiphonia* which bear *antheridia.*

On mussel shells and coralline.

CERAMIUM FASTIGIATUM.—Small pink tufts, only four inches high, forming regular fans; of richest carmine when laid out on paper, and scarcely to be called a *common* plant. It is one of the rarest and most beautiful of its family. The species was first determined by Mrs. Griffiths, at Torquay.

CODIUM TOMENTOSUM.

(Name from a Greek word, " the skin of an animal.")

In all tide-pools, and more frequently still thrown up after a storm, we find a thick, round, green sea-weed, in dense masses, often fringed with parasitic sea-weed. It has a spongy feel, and is not of any value to the collector for the album, but will be a source of interest to the microscopist, who, making a transverse section, will discover the cause of its sponginess in the cellular structure.

Generic character.—Frond green, round or flat, simple or branched, composed of tubular, interwoven, inarticulate filaments.

Fructification.—Opaque vesicles attached to the filaments. Common on all the shores of Europe, both in the Mediterranean and Atlantic; also dispersed throughout the Pacific and Indian Oceans.

DICTYOSIPHON FŒNICULACEUS.

(Name from two Greek words signifying "a net" and "a tube.")

Generic character.—Frond thread-like, very much branched; branches beset with pellucid jointed hairs. The walls of the frond composed of several rows of cells, of which the inner are elongated, the outer small, polygonal, forming a net-like membrane.

Fructification.—Naked spores, scattered irregularly over the surface.

In rock-pools, either on stones or growing parasitically on other *Algæ,* this is commonly found. Of a pale olive colour, in tufts from six inches to one or two feet in length. It dries a darker colour, and adheres well to paper.

Found everywhere on the British coast and Channel Islands.

GRACILLARIA.

(From *gracilis*, slender.)

Generic character.—Frond thread-like, tough, cellular. Central cells very large, those of the surface minute.

Fructification.—Of two kinds or distinct individuals. 1. Tubercles, like little warts, along the branches. 2. Tetraspores imbedded in the surface of the frond.

GRACILLARIA CONFERVOIDES—is of a deep red colour, dries nearly black, and does not adhere well to paper.

GRACILLARIA COMPRESSA.—Most frequently cast ashore from deep water, attached to coral or larger seaweeds.

GRACILLARIA ERECTA.—On sand-covered rocks, near low-water mark. Bears fruit in winter, and is recognized by the densely-clustered tubercles on the branches, and the lanceolate terminal pods containing tetraspores.

GRACILLARIA MULTIPARTITÆ.—This is much more showy, but is very rare. The frond is from four to twelve inches long; flat, dull purple colour, or green. Chiefly found in muddy places near low-water mark.

CYSTOSEIRA ERICOIDES.

(The name is from two Greek words signifying "a little sac" and "a chain.")

This is common in the tide-pools of the Channel Islands and southern coast of England, but seems to be rare elsewhere. We recognize it easily by the long, bushy, olive green frond, full of little pods, and having an irridescence in the water which attracts the eye.

Generic character.—Frond much branched, one to two feet long. Branches full of small air vessels.

Fructification.—It belongs to the *Fucus* tribe, and has receptacles terminating the branches containing spores and tufted *antheridia.*

This makes a very pretty specimen, though it dries black, and does not adhere to paper.

Cystoseira Granulata. — The rough, knobby stem, and more bushy appearance, will distinguish it, as also its constant incrustation with zoophytes, sponges, and molluscs. The air vessels are likewise often two or three together, and the receptacles large. Colour, clear olive green, or brown.

SPHACELLARIA.

(The name is from a Greek word, signifying "a gangrene," alluding to the withered tops of the branches.)

This plant, which has a rough, shaggy, olive or brown mass of jointed and branched filaments, may be recognized with a pocket lens. Observe the tips of the branches—they are swollen into an oblong cell containing a dark granular mass. This gives it a withered look, and you will recognize *Sphacellaria* at once

There are two distinct classes. 1. Those whose fronds are beset with woolly fibres at the base. 2. Those whose stems are naked at the base.

Sphacellaria Scoparia.—This is a fine bushy plant, frequently found in lower-tide pools, and, as it grows in deep water, is also thrown ashore after a storm.

Sphacellaria Plumosa.—This is beautifully feathered, dark, glossy, almost like the greenish black of a starling's wing, and makes a lovely specimen. It seems to prefer the rough waves of the northern coast, and grows in deep rock-pools at lowest tide. In Wales the plant is very delicate and finely formed. We get very good specimens sometimes after a storm.

SPHACELLARIA CIRRHOSA is quite a common species, parasitic on larger *Algæ*, floating sometimes in little round balls on the surface of a rock-pool. It does not adhere well to paper, but makes very pretty loose sprays for basket fancy work, to mix with zoophytes and *Plocamium*.

SPHACELLARIA FILICINA.—This grows on rocks at low-water mark, from two to four inches high. It has a little sister plant of great beauty, *Sphacellaria Sertularia*, but both are very rare: probably we should only find it on the roots of *Laminaria*, thrown up after a storm. Miss White and Miss Turner have found it in Jersey.

SPHACELLARIA FUSCA, SPHACELLARIA RADICANS, SPHACELLARIA RACEMOSA.—These are all small varieties not often found.

Fructification of this seaweed is very simple, merely oblong or pear-shaped spores, seated on the branches.

CHAPTER VI.

After a Storm.

"Children playing merrily 'twixt the sea and land,
Building baby-castles on the tawny strand,
Leaving when the day is done traces on the sand.

"White-haired sailor hearkening to an anthem grand,
Which thy life long thou hast heard, yet canst not understand
Long enough have lain thine idle traces on the sand.

"Comes the everlasting ocean roaring to the land:
Waves in wild commotion bearing down upon the strand;
Sweeping off for ever all our traces on the sand."

F. D. F.

THE sea has been troubled by the voice of the storm; we stand upon the cliffs and upon the rocky shore, and see the wild waves leap or fret against the dark rock's side. The quiet tide-pool we had dabbled in the day before is lashed into foam by the rough, yet joyous kisses of the up-coming tide—that refreshing aërating foam which is life-giving to the dweller on the rock. "The sea king is riding white horses over the deep," we used to say as children, and we thought not enough of the bit and the bridle which guideth each wave, and saith unto the strongest of them, "Hitherto shalt thou go, and no farther."

Stand awhile by the seaside whilst the gale is whistling, and the stoutest bark is tossing like a toy upon the ocean: while the wail of the sea and the drift of the shingle mingle with its thunder-voice, stand and think. Thus for six thousand years and *more* —for well we know that the almanac reckons not from the *unknown* ages, that lie hidden in those words of inspiration, "In the beginning"—but thousands of years has this restless tide ebbed and flowed; six hours coming up, six hours going down, with a brief pause of equilibrium at its turn. Once only it rose and prevailed at the word of the Creator, then fell once more and *for ever* into subjection; for the great God wrote in rainbow-letters throughout the firmament His decree, that the sea should never again be the conqueror of the world, and He set its bounds invisible that it *cannot* pass. Do you ever think of the *obedience* of each little wave as it runs sparkling over the sand, or springs up in feathery foam against the tide-mark on the shore? And if the sea-marks change, and tide level varies, is it not under the same Almighty hand that directs the procession of the equinox — a steady advance or retreat—as of "one under authority"?

We will now turn to the beach. There is a coil of tangled weed on the crest of that wave as it is left, glistening with foam, upon the shingle or the sand. The first seaweed we notice will probably be a long brown frond full of oblong pods, striped across: this is *Halidrys Siliquosa*, not fit for the collector's book, but very well worth examining. It has been described already because it is found in tide-pools, but when thrown up after a storm it is interesting, because so full of zoophytes—*Plumularia*, or the feather zoophyte often mistaken for a seaweed, and as such I have seen it in many collections. Parasitic on *Halidrys* and *Cystoseira*, which is now thrown up abundantly, we find many rare and beautiful plants for the album. A little bunch of tangled green threads may be *Cladophora Rectangularis.* It is very rare in some parts of our coast; and if you find it, float it out carefully, and recognize it by the green-jointed branched filaments, at right angles from the main stem, and with regular, opposite, lesser branches: the colour is rich grass green, and it makes a pretty specimen. Look for the crimson *Ptilota*, the scarlet *Dasya*, the rich red *Delesseria*, and pink *Nitophyllum.* Tufts may be left by any wave of the bright *Plocamium;* and fail not to drag up high and dry the stems of *Laminaria* for quiet research. We must notice the whole of that *Laminaria* tribe.

THE LAMINARIA TRIBE

Comprises three genera:—ALARIA—Leaf with a distinct mid-rib. LAMINARIA — Frond without a mid-rib. CHORDA—Frond round, unbranched, hollow.

ALARIA ESCULENTA.

(Name from *ala,* "a wing," in allusion to the winged leaflets at the base of the frond.)

This beautiful plant is abundant on the northern coasts of England and Scotland, extends throughout the whole of the Northern and Pacific Oceans. It flourishes in the deepest water and on the most exposed rocks; the roughest sea seems to be its chosen playfellow, though the delicate fronds are worn and torn by the rude waves, and we rarely find a specimen in a perfect state. The colour is clear olive yellow; the root is a mass of round strong branching fibres, the stem as thick as a small goose-quill, naked in its lower part for the length of two to four inches, then clothed with leaflets without a rib, four inches long, after which the frond begins, and varies from three to *twenty* feet in length, the margin plaited and split here and there like a frond of hart's-tongue fern. The fructification is microscopic, formed on the leaflets, which appear, when in fruit, as if partially covered with a brown crust. This crust consists of dense masses of slender transparent spore-cases, on a stalk containing four spores set in a cruciform manner.

The plant is eaten in Ireland, Scotland, Denmark, and the Faroe Islands, and has various household names—"Badderlocks," "Henware," "Honeyware," and "Murlins." Four other species are natives of America and of Asia.

LAMINARIA.

(The name is from *lamina*, a "thin plate," in allusion to the flat frond.)

Seven species of this magnificent plant belong to the British coast: our commonest are the three we find in every bay. We drag it up from the ebb of the tide—a treasure for the naturalist and conchologist. We watch it in its deep shadowy forest life, as we near the shore and glide into smooth clear water: it is a cover for the rock-fish, a lurking-place for Crabs; a world of life we dream not of, until the eye is educated to read the pages of the mighty deep.

LAMINARIA DIGITATA, LAMINARIA BULBOSA, LAMINARIA SACCHARINA.—These are the three probably at our feet after every storm. See you that broad smooth brown frond, with a thick round stem, and broad brown ribbons like a flag at the end of it? that is *Laminaria Digitata*, or "many-fingered." See you trailing on the sand or curled up between the rocks, a thinner brown frond, with crisped and curled edges, speckled most likely all over with little white shell (*serpulæ*), torn perhaps from its root? but if not, then be sure you pause to look at the knobbed and hollow bulb that once fastened it to the rocks below: *this* is *Laminaria Bulbosa*. Or do we find a single smooth brown frond, clear, olive, and glossy, perhaps semi-transparent, and with a conical root of twisted strong fibres: *that* is *Laminaria Saccharina.*

Let us take them in order—there is somewhat to say of each of them, and some others besides.

LAMINARIA DIGITATA. — *Sea-girdles, Tangle, Sea-staff, Sea-wand, Cows'-tails*—These are its familiar and pet names in the fisherman's hut. These great thick stems are cut up by the fisher-boys as handles for knives or hooks. When it is fresh the blade is stuck in, and as the stem dries it hardens, contracts closely and firmly, embracing the hilt of the blade. It takes some months to be quite firm, and then is hard and shrivelled, very like hart's-horn

To the naturalist, few plants are richer in subjects of investigation. Surely we find the beautiful transparent limpet, called *Patella Pellucida,* on the shiny frond, more surely still, snugly ensconced in the cave it has eaten out for itself, the lovely *Patella Cœrulea* is found in the centre of the fibrous root, and is known by its radiating lines of deepest ultramarine. If our frond has come from the

> "Calm depths of ocean, where the wave has no strife,
> Where the wind is a stranger, and sea-snake hath life,"

then we find coils of pink glossy ribbon, which are millions of eggs laid by the pretty sea-slugs called *Doris* or *Eolus*. If we cut off the tangled root and put it in a basin of sea water, such a host of tiny beings will come forth and swim about as may well keep the microscope at work for a whole morning; besides, the stem is fringed with small seaweeds for the album. A red cushiony spot will be *Callithamnion Pluma ;* fluttering little red banners will be *Delesseria Ruscifolia*, or fronds of the lovely *Ptilota Plumosa.*

We have not touched upon the hidden uses of this brown sea stem. Look reverently at it. Do you know that a little slice under the microscope will show you a tissue of delicate cells in which God has stored up one of the most precious remedies for suffering mankind? that He has given the *Laminaria*-stem power to abstract from the sea a precious substance called *Iodine*—that which alone can relieve the pale, sad sufferer from scrofula, reduce the swollen glands, check the ravages of cancer, act on the torpid liver, ease the racking pains of rheumatism, give the flush of health to the wasted weary invalid? Yes—this is hidden in that rough brown stem, brought out by fire in the kelp-kilns of Ireland and Scotland. Another use is its importance in the manufacture of glass: our fragile beautiful glass springs from the old brown seaweed.

Some shipwrecked sailors, making a fire with the dried weed amidst fine river sand, found the strange transparent substance in the ashes which gave the first hint of our window panes. What should we have done for soap without those sticks of tangle? And do we remember that iodine, like the violet mist of the Arabian tales, rises from the burning kelp—a genie whose power gives back the lost, the absent, the beloved? Did not the Calotype, the Daguerreotype, owe their birth to this subtile essence, compelling the sun itself to be a portrait painter?

Well may those banners float out upon the sea, and well may we ponder on the tangled fronds cast up by the storm. There is subject for a long lesson and for a song of praise in the weather-beaten stems of old *Laminaria Digitata.*

> "The sea-wort floating on the waves, or rolled up high along the shore,
> Ye counted useless and vile, heaping on it names of contempt;
> Yet hath it gloriously triumphed, and man been humbled in his ignorance.
> For health is in the freshness of its savour, and it cumbereth the beach with wealth;
> Comforting the tossings of pain with its violet-tinctured essence;
> And by its humbler ashes enriching many proud.
> Be this, then, a lesson to thy soul, that thou reckon nothing worthless,
> Because thou heedest not its use, nor knowest the virtues thereof.
> And herein, as thou walkest by the sea, shall weeds be a type and an earnest
> Of the stored and uncounted riches lying hid in all the creatures of God."
>
> TUPPER'S *Proverbial Philosophy.*

LAMINARIA BULBOSA (Sea-furbelows; Furbelowed Hangers).—When this plant is young the frond is plane and undivided, the stem short; the root is merely fibrous, with a knob near it; as it grows this knob enlarges, becomes hollow, covers the root, and throws out strong fibres, which move the growing plant to the rocks in deep water. Sometimes this bulb is a foot across, and the fronds, of which several are attached, may spread out in a circle of twelve feet in diameter—one single plant a sufficient load for a man's shoulder.

Curious little slugs and snails lurk in that grand cavern, the hollow bulb, and fishes lay their eggs there. I have found them often. There seems to be a mass of jelly thinly spread in patches within—two black dots in regular order, and an arch of minuter dots. Cut out a patch, but keep it in water until you can place it in a watch glass under the microscope. The double dots are the eyes of an unborn fish, the dotted arch its tiny form coiled up round a large air bladder. We see the circulating blood and the little heart beating, and we are glad that we did not throw away the old spiny bulb. Cut it open, if you are wise, and learn its secrets.

And those little shells upon the curly frond, what are they? Could you see it under water, calm sunny water, all these are living, lovely little creatures, so delicately yet elaborately fashioned that we hold our breath in astonishment as we gaze upon the uprising plumes from every tiny shell. These plumes are the breathing organs of the little *Serpula:* they rise and fall instantaneously at approach of food or sound of danger; and beside the plumes is a horny thread, scarlet or yellow, knobbed at the end, which, when drawn in, corks up the aperture securely. Wonderful are these specks on the *Laminaria.* Take some home and put them in a watch-glass with a little sea water, use a low power, and see the tiny creature peer forth and wave its pretty plumes. Just imagine the mechanism that is used for its safety and instantaneous retreat. By the action of muscles of indescribable delicacy, concealed in little warts or feet, the *Serpula* can throw out bundles of bristles, and on the back of each foot is a row of microscopic hooks which catch the lining of its tube, and enable it to draw in or out. These hooks are toothed; each little creature carries about 1,900 such upon its corslet, and no fewer than 14,000 teeth are fashioned and finished for the use of this atom in creation. Think of this ere you drop the frond as unfit for a lady's album: it is a page recording God's infinite care for the meanest of His creatures.

LAMINARIA SACCHARINA.—The single, olive yellow, semi-transparent frond, when young, is quite fit for the book of seaweeds, preserving its colour and adhering pretty well to paper. It well deserves its name "Saccharine," from the abundance of sweet *mannite* or manna which is secreted in its cells. This was discovered by Dr. Stenhouse some years ago: he took a quantity of this seaweed and macerated it in a particular way called "digesting" in hot water, which formed it into a brownish sweetish mucilage. When evaporated, it left a considerable quantity of saline semi-crystalline substance. This was reduced to powder and treated with alcohol, by which a considerable portion of it was dissolved. This solution yielded, on cooling, large hard prisms of fine silky lustre, very beautiful, purely white as loaf sugar, and almost as sweet. This is *mannite*, and is, doubtless, much appreciated by the "water babies," and relished by the plumed molluscs who live upon these fronds.

LAMINARIA PHYLLITIS (Hart's-tongue Laminaria).—This is considered by some merely a variety of *Laminaria Saccharina;* but the small size and delicate substance render it a desirable specimen. It grows on stones or on stems of the larger seaweed, and in deep water; so we are more likely to find it on the beach after a storm. Sidmouth, Yarmouth, Dover, Channel Islands, Ireland, Scotland.

LAMINARIA FASCIA (Small-tufted Laminaria).—On sand-covered rocks and stones, at lowest ebb of the sea, this delicate species grows. Stem very short; fronds either broadly oblong, wedge-shaped, or lanceolate; from four to twelve inches long, of a delicate membranaceous substance and olive yellow hue. Plentiful in the Channel Islands, St. Michael's Mount, Sidmouth, Plymouth, north of Ireland, and western islands of Scotland.

Two other species of *Laminaria* may be found cast up by the waves; they are comparatively rare; one is

LAMINARIA LONGICRURIS. — The frond has a remarkably long stem, which is unlike every other in being *hollow;* often six or eight feet long and an inch in diameter. It abounds in the Northern Ocean, Newfoundland, Greenland; but is washed ashore, and should be examined for rare seaweeds, diatoms, and zoophytes.

LAMINARIA CLOUSTORII.—This is almost as common on the Irish coast as *Laminaria Digitata,* but rarely in England. It has a slender *polished* stem, a narrow *lamina*, very dark frond. The stem is eighteen to twenty-four inches long, and the *lamina* from fifty to sixty inches long.

DESMARESTIA.

(Named in honour of DESMAREST, a celebrated French naturalist.)

This is a bright olive green seaweed when growing in a tide-pool; it changes to a verdigris green hue on exposure to the air, when they have the peculiar property of quickly decomposing other delicate seaweeds with which it may come into contact; another peculiarity is, that fresh specimens render the paper on which they are spread transparent as oil.

Fructification unknown.

DESMARESTIA LIGULATA (Strap-shaped Ligulata).—Fronds from two to six feet long, edged with leaflets; and these leaflets are lance-shaped, with spine-like teeth. The main frond has an obscure mid-rib, variable in breadth, set all its length with opposite branches. Young plants somewhat resemble the feathered part of a quill. Frequent on the south coast of England, Jersey, Guernsey.

DESMARESTIA ACULEATA (Spiny Desmarestia).—Fronds narrower than in the preceding specimens, from one to three feet long; the young frond, which is flat, is so clothed with long silky fringes as to appear as if overgrown with a parasitic *Conferva*. When the plant has done growing these fibres fall off, and the branches bear short spine-like *ramuli.* Colour yellowish. The old plants do not adhere well to paper. This is found in lower-tide pools; but as it prefers five fathom water, is most often washed ashore after a gale of wind. Frequent everywhere.

Desmarestia Viridis (Green Desmarestia).—It is scarcely possible to preserve the delicate filaments which edge the frond of a young plant. Beautiful as the plant is in the water, it spoils on paper unless very carefully laid out. It is best to raise it gently, and dry it without any pressure.

In the water it appears of a rich orange, tinted with brown; but, as in others of the tribe, a few minutes' exposure to the air suffices to turn it to a light verdigris green.

This also may be found in tide-pools as well as on the shore.

ARTHOCLADIA.

(Name meaning "a joint" and "a branch," in allusion to the nodose or joint-like knobs of the frond.)

This slender elegant plant grows on submarine plants and in *Zostera* beds.

Generic character.—Frond thread-like, cellular, with a jointed hollow stem, knobbed, and at each knob producing whorls of delicate jointed filaments.

Fructification.—Beautiful under the microscope. It consists of minute lanceolate pods (*stichidia*) which resemble strings of green glass beads: each apparent bead is a spore, which, when mature, breaks through the membrane and falls into the water.

As this plant resembles *Conferva* in colour and texture, it requires careful examination. The whorls of feathery filaments decide its name. Found in the Channel Islands, and on south coast of England, but is rare.

DASYA.

(Name signifying "hairy.")

This is as much desired a plant as the bright *Plocamium.* The crimson feathery tufts preserve their colour, and form one of our most beautiful pages in the collection; for fancy work on cardboard it is invaluable. Although it may certainly be gathered on rocks at low-water mark, yet it is most frequently found on the shore after a storm.

There are four species, all well worth seeking.

The commonest is *Dasya Coccinea.* Stem from six to eight inches long, undivided, thick as a small cord, and clothed with short shaggy hairs. A thin slice of this under the microscope shows nine radiating siphons round a small cavity, bordered by a band of minute cells. The fruit is truly beautiful, and consists of two kinds.

Fructification.—1. A transparent urn or capsule, called *ceramidia,* containing a tuft of crimson spores, seated between two forked *ramuli* or little branches. 2. *Stichidia,* or oblong pods, also transparent and like net-work, containing tetraspores arranged in transverse bands.

It will strike the intelligent observer at once that there must be a strong relationship between the *Dasya* and the *Polysiphonia;* and so there is: nor could I find a better lesson to test the value of a microscope for classification than with a bit of that coarse brown shaggy weed, *Polysiphonia Fastigiata,* growing, as you know, on all the *Fuci,* and with a bit of this delicate feathery crimson *Dasya,* to show you precisely the same structure of stem, siphons ranged round a central tube, urn-shaped fruit containing spores, tetraspores—though here the difference is found: in *Polysiphonia* they are immersed in swollen *ramuli;* here, they are borne in lanceolate pods. But there *is* a near relationship, consequently you will find them in the Synopsis close together in rank.

DASYA OCCELLATA.—On mud-covered rocks, rare. The name was doubtless given because of the eye-like spots caused by the density of the *ramuli* at the tips of the branches. The waving plumes are like little peacock's feathers. It is usually dredged up from muddy banks, but was discovered by Mrs. Griffiths on the pier at Torquay.

DASYA ARBUSCULA.—On the rocks near low-water mark; not certainly common, and yet, perhaps, often overlooked or mistaken for a *Callithamnion* by young collectors who do not use the microscope.

The texture of a *Dasya,* as well as its fruit, can never be mistaken when once seen.

DASYA VENUSTÆ.—This we only find cast ashore in the summer and autumn: a most lovely little plant. Discovered by Miss White and Miss Turner on the shores of Jersey.

BRYOPSIS PLUMOSA.

This pretty green feathery seaweed is a great prize, so rich and glossy is the deep green, and so elegant the sprays, floated out upon the paper to which it adheres. Only in deep shadowy pools, or parasitic on *Laminaria Saccharina* do we find it. The best way of gathering this and many others is to go in a boat at lowest tide and skirt the rocks with hand-net, or long pole having a hook at the end, and so looking down into the calm water, many lovely seaweeds, otherwise unattainable, may be gathered, especially on our western coast.

PTILOTA PLUMOSA.

"Full many a gem of purest ray serene
The dark unfathomed caves of ocean bear;
Full many a flower is born to blush unseen,
And waste its sweetness on the desert air."

This lovely little plant is rightly named *Ptilota*, from a Greek word signifying "pinnated," from its innumerable small branches or *pinnæ*, with which the stem is closely branched right and left, and these again cut into exceedingly fine divisions called *pinnulæ*. At the top of the latter we find the fructification.

It consists of two or three minute capsules called *favellæ;* each of which contains three or four oval seeds, and they are themselves surrounded, and apparently protected, by several linear segments bending over them.

This is a very favourite mounted object for the microscope, its cellular tissue being so transparent that the cells containing the crimson *endochrome* can be distinctly seen.

When fresh gathered for observation, the *favellæ* are of a rich crimson, with a pellucid border, and, seated in their little cage of crimson *pinnulæ,* are really beautiful.

Another kind of fructification is found on *Ptilota,* but on distinct individuals: the *pinnulæ* are broader at the tips, and covered with oval bodies, called tetraspores, from their containing four seeds.

Ptilota is a perennial plant, found in summer and autumn, frequently growing on the stems of *Laminaria Digitata;* and therefore our best specimens may be gathered on the beach after the autumnal equinoctial gales. At Torquay it is found on rocks, but *Ptilota Sericea* is often mistaken for it; this latter is very abundant on the rocks at Moulin Huet, in Guernsey, hanging in rich silky masses on the sheltered side of the rocks, and thronged with that minute but lovely zoophyte, *Eucratia Chelata.*

STILOPHORA RHIZODES.

It is a yellowish brown plant from six to twenty inches long, thread-like branches, somewhat like *Cera-*

mium or *Conferva*, but removed from both tribes by its fructification. Observe the knots or warts which roughen the stem and give it a peculiar beaded appearance. These warts are full of jointed filaments and oblong olive-coloured spores. If we leave this any time in water, it quite spoils and turns to a jelly. Frequently found on the south coast of England, and in Jersey.

ASPEROCOCCUS.

(Name signifying "rough seed.")

This will look like a mass of green *Ulva* until it is floated out, when the long yellow-green tapering frond shows large oblong dots covering both sides of the frond, which will decide its name. There are three species.

Asperococcus Compressus.—Fronds pale yellow or olive green; hollow swollen tubes tapering to a point at the stem. Thrown up after storms.

Asperococcus Turneir. — Large, puffy, green fronds, swollen and contracted at intervals, with very small spots, and found between the tide-levels on stones and in muddy bays. This is a very good species for the herbarium.

Asperococcus Echinatus.—Long, thin, greenish or olive brown fronds, sometimes twenty inches long, but also in little two or three-inch plants, when they are extremely pretty on paper, and adhere well to it. This species, when young, is so beset with pellucid fibres as to have a *woolly* appearance under water, or bristled out like a bottle brush. It grows in deep water, and often thrown up after a storm on all parts of the British coast.

SPORONCHUS PEDUNCULATUS.

(Name from two Greek words signifying "a seed" and "wool.")

This is certainly not a common plant. It grows in deep water, and can only be obtained by dredging or after a storm, but is exceedingly beautiful, waving its feathery branches in the water. Under the microscope, or even with a pocket lens, we see the branches margined throughout with seed vessels. These spore-cases or receptacles appear first as warts on the stem; they become gradually stalked, and the oval pod is crowned with a pencil of most delicate hairs, which eventually fall off. If we cut one of these pods across we see a slender axis within, whorled with filaments bearing oblong olive spores. Colour when fresh, clear olive, drying to a yellow-green, becoming brown in age. The young plant adheres closely to paper in drying. Found on the south coast and the Channel Islands.

CUTLERIA MULTIFIDA.

(Named after Miss CUTLER by Dr. GREVILLE, in honour of her researches in Algæology.)

This is an olive green, flat, much divided frond, somewhat fan-shaped, irregularly cleft; from two to twenty inches long. It is a native of Spain, south of France, Mediterranean Sea, and we find it on the coast, or pick it from the dredge or fisherman's nets. Here I would advise students to examine lobster pots, cables, floats, and oyster shells, which may amply repay him by minute but beautiful specimens, either for his book or the microscope.

Cutleria has a twofold fructification. 1. Spore-cases, stalked, oblong, containing about eight spores: clusters here and there on the frond are like black dots, or still more like the black fungus on the under side of rose-leaves in autumn, called *Puccinea.* 2. *Antheridia,* which are like airy sausages attached to tufted filaments, densely zoned with dotted lines scattered over the whole frond. The substance of the frond itself is like exquisite net-work. Colour, foxy olive.

Very often this is washed up in great quantities.

KALYMENIA RENIFORMIS.

(Name from two Greek words signifying "beautiful" and "membrane.")

Generic character.—Stem short, suddenly expanding into a broad, flat, roundish, red frond. *Favellæ* densely scattered over its surface.

Kalymenia is rarely *gathered* on our coast, but often picked up, crumpled and torn, amidst seaweed left by the tide after a gale of wind. A mass of blood-red membrane, sometimes eight inches or even a foot in diameter, gritty to the touch from the abundance of fruit, about the size of poppy-seeds, which are scattered over it. It is found in the Isle of Wight, Scilly Isles, and Channel Islands, also on the coast of Devonshire and Ireland.

KALYMENIA DUBIZI—is a still rarer species, of smaller size, found at Plymouth; upright like *Iridea*, though in texture quite like *Kalymenia Reniformis.*

STENOGRAMME.

(The name from the Greek words signifying "a narrow line," alluding to the linear fructification.)

Never found growing, but has been found washed up from the ocean's depth, in November. It is very like *Rhodymenia Palmata*, but more brightly pink, and with lines in the frond that would seem to be interrupted nerves, but are really linear *sori*, or masses of minute spores.

Generic character.—Frond rose-red, leaf-like, nerveless divided, fork-like at the tips.

RHODYMENIA.

(Name from two Greek words signifying "red" and "membrane.")

Generic character.—Frond red or fine pink, quite without veins; sessile, or with a short stem, which expands immediately into the frond.

Fructification.—1. Hemispherical scattered capsules. 2. Minute granules, spreading over the surface, or forming cloudy patches.

There are seven species of this seaweed, and they all grow in such deep water as to be more frequently picked up after a storm than gathered from the rock, except, indeed, the first I shall notice:

RHODYMENIA PALMATA.—We gather this abundantly on the coast of Ireland and Scotland: every child will tell us it is *Dulse*, or *Duillisg*, or *Dillisk—the leaf of the water*—which poor Irish families eat as the only relish they can have with their potatoes, and Highland crones steep in water, and give medicinally in fevers. In the islands of the Archipelago, it is a favourite addition to their *ragoût*. For our album, in truth, the frond is rather thick, and does not adhere as well to paper as the finer species. We find it in a young state on the stems of the *Laminaria*, or parasitic on *Fucus Serratus*. The red, ribbony fronds, spreading sometimes like a fan, are easily recognized everywhere. The fruit is, on some plants, a cloudy patch of dots on each expanded tip, or berries seated on the margin of the frond.

RHODYMENIA CILIATA. — Sometimes at extreme low-water mark we may gather this, and recognize it by the fibrous root, the broad frond edged with small leaf-like segments; and if it is in fruit, the *tubercles* or *coccidia* are seated along the margin, looking like birds' heads, the beak on one side, and the dark mass of spores resembling the eye. Colour, a deep, full red, semi-transparent when fresh, becomes darker in drying. After a storm it is common on all our coasts.

RHODYMENIA JUBATA. — The frond is dull red, turning to orange or olive green at the tips, and edged with *cilia;* sometimes densely covered with long red filaments, from three to six inches long or more, which clasp round each other and the neighbouring plants in a very entangled mass. It varies in growth extremely: sometimes the whole frond, instead of its usual *flat* form, becomes cylindrical and excessively branched, beset with horn-like *ramuli.* The fruit is either *a berry* or *coccidia,* containing small spores on a central placenta, or tetraspores imbedded in the surface of the frond.

Frequently cast up after a storm on all our coasts, and in the Channel Islands we gather splendid specimens at vraicking-time on roots of *Laminaria,* which are cut away from the rocks beyond tide mark.

RHODYMENIA BIFIDA.—Cast ashore on our island coast, but is a native of the deep Atlantic and the Mediterranean Sea. We recognize it by its thin, delicate rosy frond, much divided, the margin sometimes lightly fringed and dotted with *sori.* It is, nevertheless, a varible plant, not always easy to make out more than that it is a *Rhodymenia.* The frond is sometimes narrow, and dries a dark brown; at other times fan-like, with broad segments, and beautifully pink.

RHODYMENIA LACINATA. — On *Laminaria* stems and rocks beyond the tide. Cast up by the troubled waves, this splendid seaweed is a prize. The broad, bright red frond spreads over the page of our album, with many segments crisped and curled at their edges, closely fringed with minute processes, in which *tubercles* are formed. The colour is really beautiful, and preserves well in drying. Coast of England and Ireland, and Channel Islands ; especially beautiful in Alderney.

Rhodymenia Cristata.—A small variety, a northern species, very rare.

SPHÆROCOCCUS.

(Name from the Greek words signifying "a sphere or globe" and "fruit.")

Generic character.—Frond flat, excessively branched, forked repeatedly, and usually edged with fruit.

Fructification. — *Tubercles* or *coccidia* imbedded in the *cilia,* which fringe the frond. Colour, a fine scarlet pink.

With a pocket lens we see a faint mid-rib running up the frond. It is a beautiful specimen for the album, and preserves its colour well in drying. Rarely found except on the shore after a gale, and then we may find fronds from six to twelve or eighteen inches long. Found in Jersey, Guernsey, and Sark; also in the south of England and Ireland.

CHAPTER VII.

What to do with our Seaweeds.

A VERY important question this, which in answering I must preface by the advice, to collect as little at a time as you can afford, according to your stay in any locality, and collect them either in an oilskin bag or a tin can with sea water; for these flowers of the sea fade, and even decompose marvellously fast, when roughly handled or carelessly gathered.

The best time for collecting is in the early morning, when, on your return, there is leisure for immediately laying them out. If you come home over-tired, and leave them until next day, the chances are that one-half of them are spoilt. I need not repeat that the finest and rarest specimens are found in the lowest-tide pools, or cast up after a storm; but even at high tide the seaside naturalist will find most pleasant occupation and delightful surprise if with a microscope he investigates those very small specimens which are too insignificant for the lady's album, and finds such form and colour, provision and harmony, as the Almighty Creator conceals from the unseeing eye, to reveal to our patient and intelligent research.

Supposing, however, that we have searched a few tide-pools, and brought home a tangled mass of olive, red, and green seaweeds, we get some soup plates, fresh water, a bit of alum, some camel-hair pencils, and *I* use needles, mounted on lucifer matches, to assist in disentangling the mass.

Of course we are provided with paper cut into large and small squares; and as much of the beauty of the specimens depends on the quality of the paper, it should be fine, and at the same time stout, almost as good as drawing paper.

Now float a piece of weed in fresh water; if very dirty or sandy, wash it first, and in renewed water float it on a piece of paper supported by your left hand, whilst with your right hand you arrange the plant in a natural manner, using a mounted needle or porcupine-quill, and thinning out the superabundant branches with a fine pointed pair of scissors. When the specimen is placed as you like it, cautiously raise the paper that the position of the plant be not altered, and let it rest somewhere with sloping inclination, that the moisture may run off whilst other specimens are treated in the same way.

Do not leave them long thus, for they must be pressed before the paper is dry.

A convenient travelling press consists of two pieces of deal board about two feet long and one foot wide, a couple of quires of whity-brown paper, and a double strap, such as we use for railway wrappers. Lay blotting paper between the coarser paper, and you can strap them closely, and carry your seaweed very safely in your hand.

In drying them, you must have old linen or fine muslin, old and soft, to lay upon the weed and prevent its sticking to the upper paper; but do not leave it beyond a day or so, lest it leave chequered marks upon the surface of the weed, especially those with broad fronds, like *Delesseria.*

Experience will give the best lessons. Some seaweeds, such as *Melogloia,* which are glutinous, must not be pressed at all, but laid out to dry, and when perfectly so, then moisten the *under* side of the paper, and give a gentle pressure only

Others will not adhere to paper, and therefore, when dry, brush them over with a little isinglass dissolved in gin (laid on warm), and they will then be fixed closely to the cardboard or paper.

Another preparation is: one ounce oil of turpentine, in which some gum mastic the size of a nutmeg has been dissolved. This gives a gloss to the specimen and helps to preserve the colour.

You must change the blotting paper and muslin at least twice during the process of drying larger seaweeds; the smaller ones will be ready in a couple of days for the album, on the second day giving heavy pressure by stones and weights besides the strap.

CONCLUSION.

In this little Manual I have restricted myself to the Seaweeds I know to be most valuable to a young collector for album or fancy work, and by no means offer it to my scientific friends, who have access to the expensive and complete works of Harvey and Landesborough. In compiling it, I have written from my own collection, and looked into the tide-pools day by day.

I have turned over the *vraic*-heaps as they were carted up from the lowest tide, and tracked the footsteps of the storm on the shingly beach. If I have forgotten or omitted any worthy seaweed, I shall with pleasure add it to the next edition of this little book. Meantime, I trust I have opened an easy pathway to the "Treasures of the Deep," and suggested a microscopic investigation that will richly repay the intelligent observer.

L. L. C.

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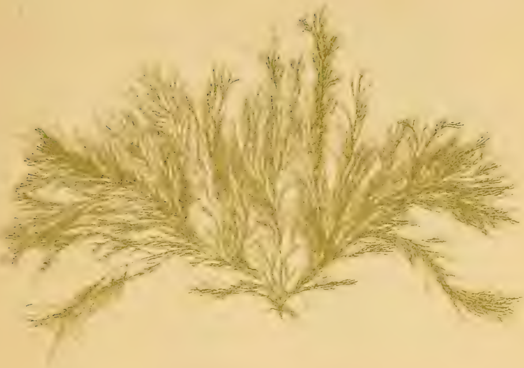

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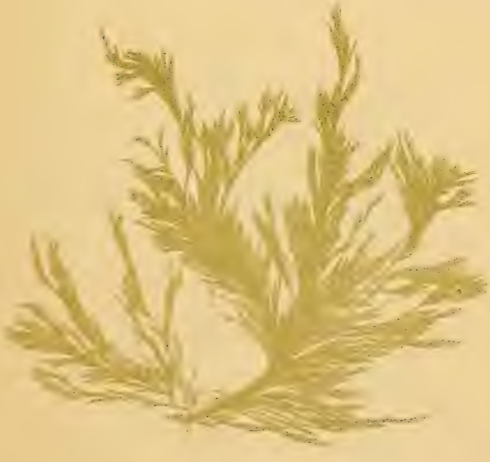

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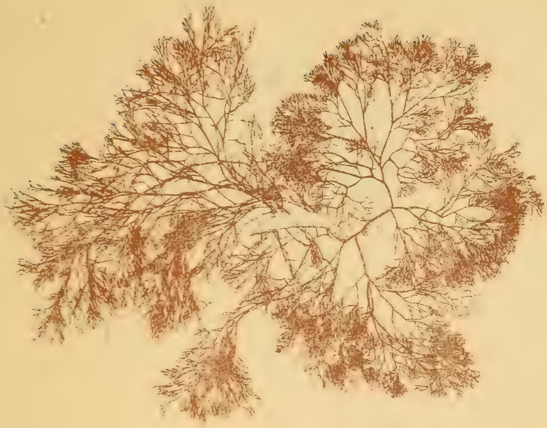

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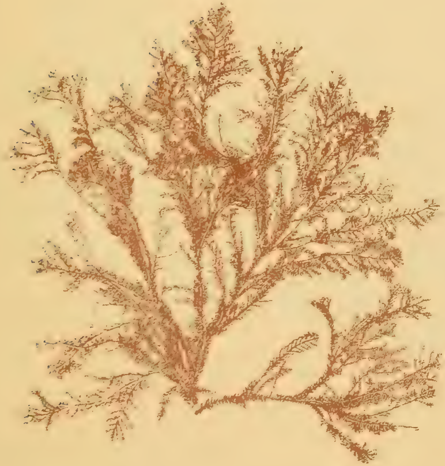

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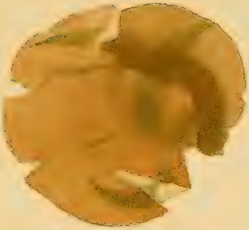

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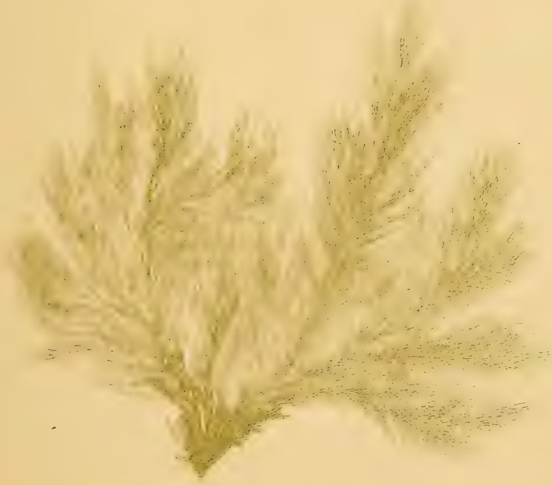

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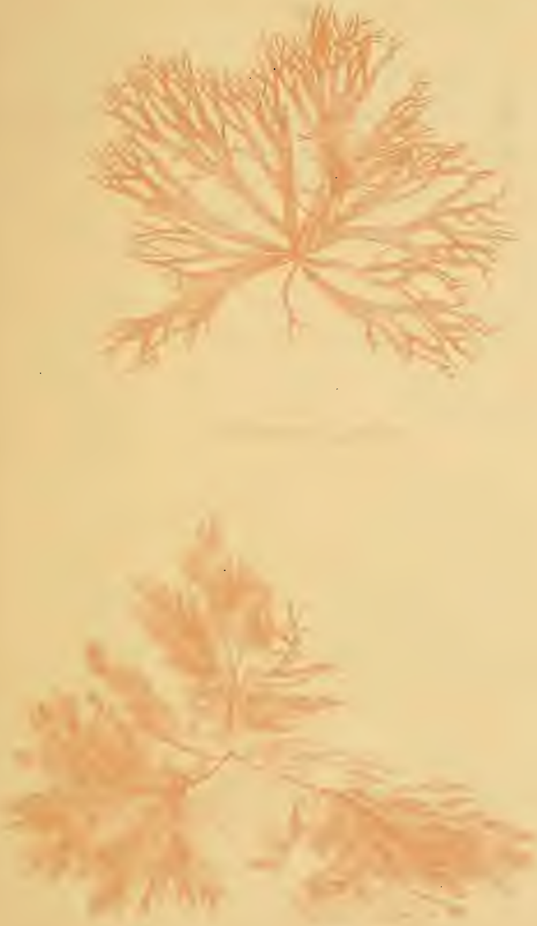

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